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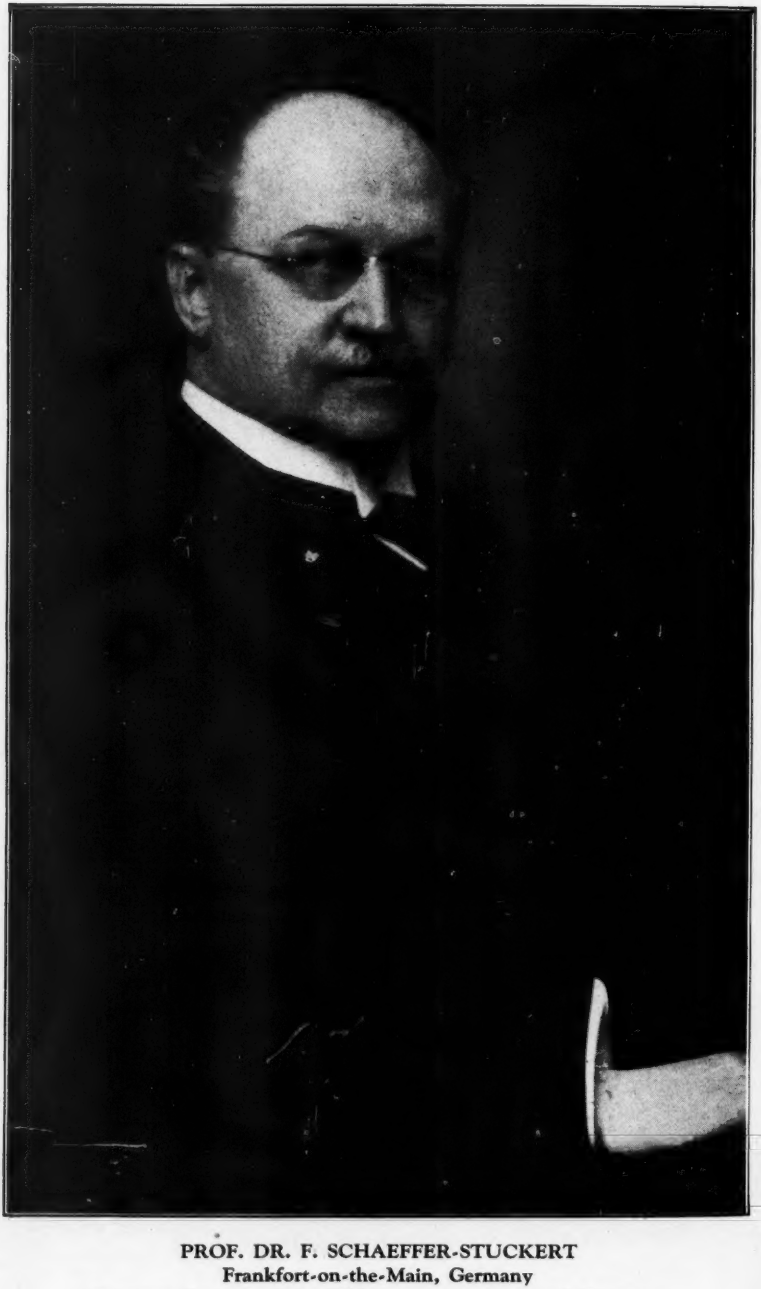

PROF. DR. F. SCHAEFFER-STUCKERT
Frankfort-on-the-Main, Germany
Secretary-General of the Fifth International Dental Congress

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Original Communications

DENTAL CARIES AND PULP SEQUELAE RESULTING FROM EXPERIMENTAL DIETS*

By JOHN ALBERT MARSHALL, D.D.S., Ph.D., San Francisco, California

THE object of the experiment here described was to determine whether or not the changes produced in developing teeth of rats on deficient diets were comparable to those found in dogs, on which reports have been previously published. The rat was chosen for the reason that it is better adapted in some respects for laboratory purposes than are the larger animals.

At birth, the albino rat (*Mus norvegicus-albinus*) is hairless, blind, short-tailed, with closed ears and undeveloped limbs. In response to contacts or to olfactory and taste stimuli, it utters a squeaking sound. It is capable of some locomotive movements which combine the motions of wriggling and paddling, and can find its way back to the mother by the tenth day. The eyes open at about the fourteenth or seventeenth day. Sexual maturity occurs at about 60 days, and females begin to breed at about 90 days.

The female may be impregnated one or two days after producing a litter. The period of gestation is from twenty-one to twenty-two days, so the female is able to free herself from the first litter before the second is born.

It is possible to modify the size of the litter by feeding the mother on restricted diets. It has been shown, for example, that the feeding of ox flesh exclusively to albino rats causes much

*From the Anatomical Laboratory and the laboratories of the College of Dentistry, University of California.

*Read before the Section on Anatomy, Physiology, Materia Medica and Therapeutics, Seventh International Dental Congress, Philadelphia, Pa., Aug. 24, 1926.

*Aided by grants from the Board of Research, University of California, the Research Commission of the American Dental Association, and the California Stomatological Research Group.

less frequent pregnancy, a smaller litter and a smaller average litter weight. In fact, an exclusive meat diet is unfavorable for breeding or growth.

The span of life in the rat proceeds about thirty times the rate of that of man, so that a 3-year-old rat is equivalent to a 90-year-old man. The menopause comes at about the fifteenth to eighteenth month, which is equivalent to the thirty-fifth to forty-fifth year in woman.

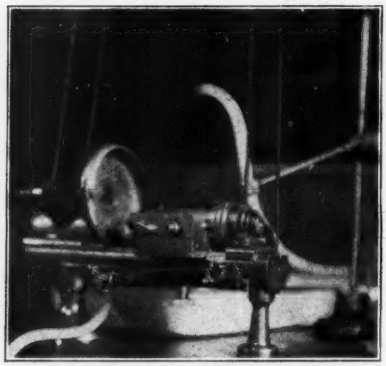

Fig. 1.—Grinding apparatus consisting of bed plate, micrometer, tailstock, water splash guard and pulleys.

It is well known that the teeth of the albino rat possess certain peculiarities common to all rodents. The dental formula is as follows: $\cdot\frac{1}{1}$, $C\frac{0}{0}$, $P\frac{0}{0}$, $M\frac{3}{3}$. Although they are monophylodont, this set of teeth is divided into two distinct types. The incisors grow from a persistent pulp and are erupting constantly throughout life. The molars do not. The initial eruption of both incisors and molars extends for a period of about twenty-five days. From eight to ten days after birth, the incisors first appear. At about the twentieth day, the first and second molars appear, and about the thirty-fifth day, the third molars. According to Owen,[1] the earlier stages of dental development commence with the 14-day fetus, and, in five days, the development proceeds from the first slight thickening of the oral epithelium to the differentiation between the ameloblasts and odontoblasts. At birth, enamel and dentin formation have begun, and a little over a week later, eruption commences. Throughout the life of the animal, both upper and lower incisors grow on an average of 2.2 mm. per week in the upper, and 2.8 mm. in the lower.

Fig. 2.—Micrometer tailstock.

It will be recalled that Erdheim[2] utilized the rat for his experiments on the parathyroid gland. When these glands are cauterized or extirpated, the teeth become very fragile and tend to break easily, changing from a normal semi-translucency to a pathologic white opacity.

It was probably this observation that attracted the attention of several investigators, especially those who are interested in calcium metabolism. Since the animal responds so readily to endocrine derangement, and, in this case at least, to abnormalities in calcium deposition,

1. Owens, Richard: On the Anatomy of the Vertebrates. Mammals Mus Decumanus. Alimentary Canal, Vol. 3, London, H. Bailliere, 1868.

2. Erdheim: Mitt. a. d. Grenzgeb. d. Med. u. Chir., 16:632, 1906.

it was thought that changes in bone and tooth structure might be studied to advantage. McCollum, Grieves, Steenbock, Sherman and many others have reported at length on the various experimentally produced avitaminoses of rats. Since the dental embryology of these animals has been so well worked out by Owens,[1] and again by Donaldson and others, it was decided to parallel, if possible, some of the work of McCollum and to observe what comparative dental and osseous changes occur in the new born fetus; in the 30-day old animal, when incisors and first and second molars have fully erupted,

Fig. 3.—Normal male rat, aged 4 months.

and in the 51-day animals, on the complete eruption of the third molars.

The diets utilized in this work were prepared in the diet kitchen of the anatomic laboratory of the University of California. Through the kindness of Prof. Herbert M. Evans, it has been possible to obtain whatever material was required, and I take pleasure in acknowledging at this time my indebtedness to him and to his associates and my appreciation of the many courtesies in placing at my disposal his laboratory facilities.

Fig. 4.—Normal female rat, aged 4 months.

There have been more than 200 animals used in this work. Some of these were discarded at various times during the experiment as unsuitable. Four specimens were obtained from each head, and, from these, sufficient data have been collected to warrant certain conclusions in regard to the effects of

Fig. 5.—Litter from animals shown in Figures 3 and 4. On weaning, they were placed on a diet deficient in vitamin A.

deficiencies of vitamin A on the development and degeneration of tooth structure.

Fig. 6.—Animal from litter shown in Figure 5. This animal and those shown in Figures 7-9 are avitaminotic.

The dissection consisted in dividing the head into right and left half at the median line and making a ground section of either the upper or lower jaw and a decalcified section of its opposite. In this way, a lower right ground section of the posterior teeth was compared with an upper left ground section of the posterior teeth. Similarly, the decalcified sections were compared by selecting opposite jaws and opposite sides. These were prepared by my assistant, Miss Lona M. Noble, and were cut serially, so that in most of the work there are complete serial sections. The ground sections were all prepared from start to finish in every detail by myself.

The methods of technic as usually described have not been entirely satisfactory, and it was found necessary to make certain modifications, which are believed to be original in some respects.

METHOD OF PREPARING GROUND SECTIONS

The dissected portion of the head, after being immersed for at least a week in a solution of formaldehyd, 10 per cent dilution, is washed thoroughly and examined under a binocular dissecting microscope, with a 55 or 40 mm. objective and 6 X or 12 X ocular. This gives magnifications between 13 and 40 diameters. In the case of the decalcified sections, the higher powers have been used, as the 25 mm. objectives with a 20 X ocular, which gives a magnification of 148 diameters.

Fig. 7.—Animal from litter shown in Figure 5.

The preparation of the ground section consists, first, in holding the specimen lightly by hand against the flat side of a carborundum grinding disk

Fig. 8.—Animal from litter shown in Figure 5.

mounted on a modified jeweler's lathe, similar in many respects to that used by G. V. Black. It is essential that the stone be kept thoroughly moist with cold water and that it be revolved slowly. The tissue cuts very readily and tears when too much force is used to press it against the stone or when the stone revolves too rapidly. This preliminary grinding is somewhat difficult and must be carefully watched through the binocular microscope. When that portion of the tissue near the center of the tooth is exposed, the grinding is continued by using, successively, stones of finer grits. The section is polished with an Arkansas stone, which is first freed from oil by soaking in xylol over night. After evaporation of the xylol, cold water is used exclusively for polishing the specimens. All scratches are removed by this method.

Fig. 9.—Animal from litter shown in Figure 5.

Fig. 10.—Avitaminotic animal, aged 10 weeks.

Fig. 11.—Avitaminotic animal, aged 10 weeks.

The next procedure is to stain the section in mass. It is carefully washed in running water and brushed lightly with a moistened camel's hair brush, then stained with Harris hematoxylin[3] and eosin stain (a few drops of the aqueous solution in a stender dish of distilled water). In some cases, Mallory's connective tissue stain was used. It will be recalled that, with the Mallory connective tissue stain, tissues are ordinarily colored as follows: blue: cartilage, light blue; bone, dark blue, also connective tissue reticulum, collagen fibrils and mucous, amyloid hyaline substances; red: the nuclei, cystoplasm, axis cylinders, neuroglia fibers, fibroglia fibrils and fibrin; yellow: red blood corpuscles and myelin sheaths; yellow or pink: elastic fibers. In other cases silver nitrate, 1 per cent solution was used.

After staining, the tissue is placed directly in alcohol, 80 per cent, then 90 per cent, 95 per cent and absolute; creosote, and two changes of xylol. The section is now ready for mounting in balsam preparatory to grinding the opposite side.

I have had made several grinding disks which fit on a special type of micrometer headpiece as shown in Figures 1 and 2. These disks are warmed slightly in a flame, and a drop or two of balsam is placed on them. The tissue is then carried carefully from the xylol and pressed, with some firmness, on the grinding block. It takes usually from a week to ten days, sometimes even longer, for the balsam to harden thoroughly. I have found it

Fig. 12.—Two male rats, aged 27 and 28 days old (W 6997 and B H 7010), on diets deficient in vitamin A.

3. Formula:

Hematoxylin	1.0 gm.
Alcohol (95%)	10.0 c.c.
Alum	20.0 gm.
Distilled water	200.0 c.c.
Mercuric oxid	0.5 gm.

Dissolve hematoxylin in alcohol. Dissolve alum in water by aid of heat. Add hematoxylin solution and bring to a boil as rapidly as possible. Add 0.5 gm. mercuric oxid. Solution at once becomes a dark purple. When this occurs, remove vessel containing solution from flame and cool quickly by plunging into cold tap water. (From Guyer, Michael F.: Animal Micrology. Revised Ed., Chicago, Ill., University of Chicago Press, October, 1924.)

better to use a thin solution of balsam rather than a thick one, for the reason that it penetrates more deeply into the tissue and holds the specimen more firmly to the block. Unless great care is exercised, recementing of the tissue on the block is sometimes necessary. The disk with the mounted specimen is then screwed on the micrometer-fed tailstock. The cylinder of the tail-stock revolves at a slow speed and is pressed automatically, by means of a spring, against the slowly revolving face of the wheel. Gradually, as the specimen becomes thinner and thinner, it is examined from time to time under

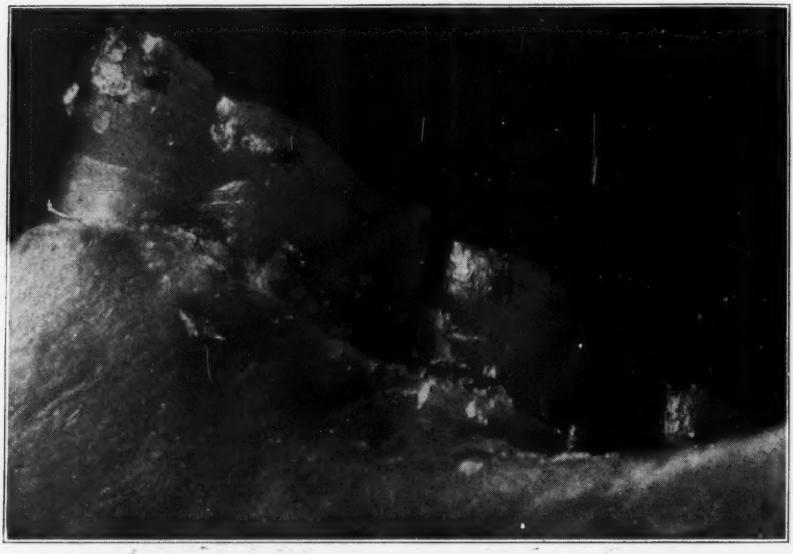

Fig. 13.—Molar teeth from normal rat, aged 2 years, at death; buccal aspect.

Fig. 14.—Molar teeth from normal rat, aged 2 years; occlusal aspect.

the microscope until the requisite thinness is reached. This is judged by comparing a decalcified section of known thickness with the ground section, under the binocular microscope. When this comparison has been made, the micrometer attachment on the tailstock is set so that 10 micra, or more as desired, can be removed by grinding. The specimen is again examined and compared for thickness with the decalcified section. By repeating this procedure two or three times, fairly uniform ground sections may be obtained. These are later polished. The process is exceedingly tedious and time consuming. When the section has been so prepared, it is finally examined for

Fig. 15.—Calculus and atrophy of gingival crest of alveolar process from avitaminotic animal.

Fig. 16.—Side view of incisor from a female rat, aged 375 days (R 306), that had been on a diet deficient in vitamin A. There is no apparent caries, but quantities of calculus.

scratches, and, if found free, is brushed off and carried again through the alcohol and finally into xylol. It is allowed to soak in the xylol for a few moments, and gradually the balsam is dissolved from the grinding disk, and the completed specimen may be mounted on a slide.

Fig. 17.—Molars of a female rat, aged 375 days (R 308), that had been on a diet deficient in vitamin A. There is caries of the first and second molars.

TECHNIC OF DECALCIFICATION

(*a*) *Celloidin Method.*—The tissues are carried up through the alcohol and completely hardened. They are then placed in ether-alcohol for one hour and then in a 1 per cent solution of celloidin. From the 1 per cent celloidin solution, they are carried up

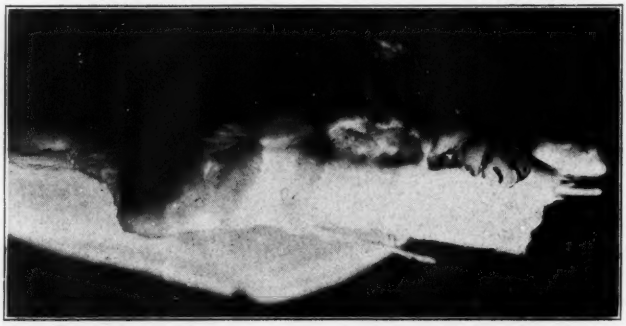

Fig. 18.—Caries of the first molar of a male rat, aged 596 days (R 304), that had been on a diet deficient in vitamin A.

through ten celloidin solutions (4, 6, 8, 10, 12, 14, 16, 18 to a 20 per cent solution). The tissues so embedded are hardened in chloroform for one hour. They are then transferred to 80 per cent alcohol for one hour and decalcified in solutions containing 5 c.c. concentrated nitric acid, or hydrochloric acid, and 95 c.c. of 80 per cent alcohol. The decalcifying solution is changed

Fig. 19.—Teeth showing no caries but great quantities of calculus, with gingival recession, in a female rat, aged 375 days (R 307), on a diet deficient in vitamin A.

Fig. 20.—Extreme pocket formation in jaw opposite to that shown in Figure 19 (R 305).

every twenty-four hours until the tissue is completely decalcified. This takes about four days.

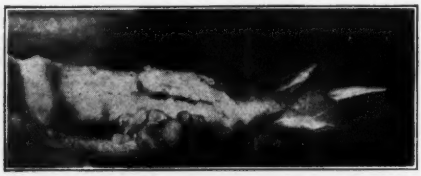

Fig. 21.—Carious first molar in a female rat, aged 434 days (R 298).

After decalcification, the tissue is placed directly in running tap water and washed for twenty-four hours.

Fig. 22.—Caries in a male rat, aged 596 days (R 302).

After washing, the tissue is transferred to 35 per cent alcohol for one hour and then kept immersed in 80 per cent alcohol until cut. After cutting, the sections are stained according to the usual technic, with either the Harris hematoxylin solution or the Mallory connective tissue stain. In some cases in which celloidin sections have not been satisfactory, the material has been embedded in paraffin.

(*b*) *Paraffin Method.*—The tissue is taken from the formaldehyd fixative, washed in running water for twenty-four hours, and hardened by running up through alcohol. At least one hour is allowed for each change, and, with human material, even twenty-four hours. After hardening, it is run back to 80 per cent alcohol and placed in the decalcifying solution of 5 per cent

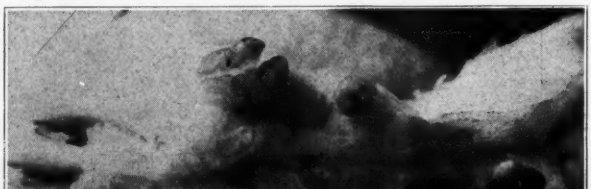

Fig. 23.—Extensive caries in a female rat, aged 390 days (B H 6469).

nitric acid in 80 per cent alcohol, in which it remains until it is decalcified. In place of this alcohol-nitric acid solution, there may be used, particularly

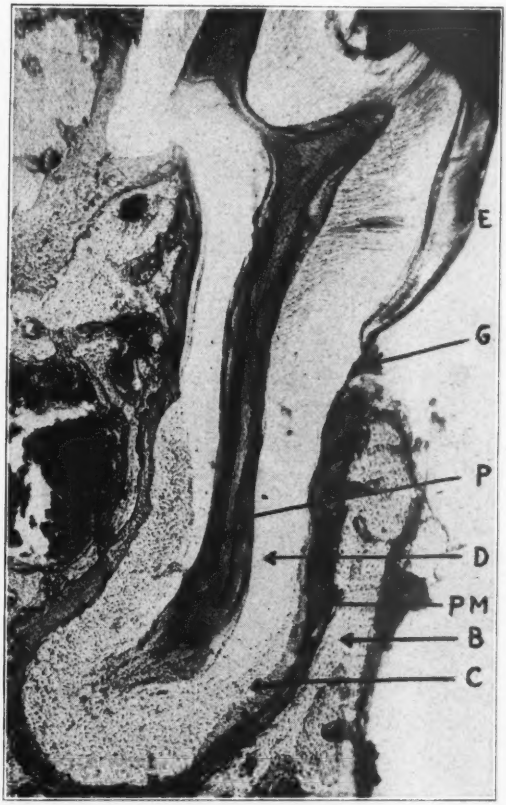

Fig. 24.—Longitudinal ground section of portion of left mandible with mesial half molar of normal adult rat. (× 32.)

with human material, a nitric acid mixture of phloroglucin.[4] This solution is very satisfactory for decalcifying, but not so satisfactory from the standpoint of staining, for the dark color is difficult to bleach out. After decalcification, the tissue is washed in tap water for twenty-four hours to remove any trace of the acid, and then dehydrated and embedded.

The paraffin sections are, of course, much thinner than the celloidin ones and, from that standpoint, are more

4. One gram of phloroglucin is dissolved in 10 c.c. of concentrated nitric acid, the solution being kept rather cool by immersing the flask in cold water. After the phloroglucin has dissolved, it is further diluted with 100 c.c. of 10 per cent nitric acid.

satisfactory. The main objection to the paraffin method consists in the fact that the tissue cannot be embedded until after it is decalcified and this, in some of the more fragile tissues, as are found, for example, in animals fed on a diet low in vitamin A, was a distinct disadvantage. It is also much more difficult to embed and cut a large mass of tissue in paraffin than in celloidin.

In handling the serial sections, it is customary to take each section as it is cut from the knife and place it on a small square of white bond paper. These pieces of paper are placed, tissue down, in a small stender dish of 80 per cent alcohol, in the order in which they are cut.

After the entire block has been cut and the tissue is ready for staining and mounting, the section on top, although it is the last one cut, is usually numbered "one." The sections are taken from the stender dish and run down through 60 per cent and 35 per cent alcohol, and distilled water, and then placed in the stain. The tissue remains in the stain from five minutes to half an hour. It is best to let the tissue "overstain," thereby making it easier

Fig. 25.—Longitudinal ground section from avitaminotic animal. (× 20.)

to regulate the stain by decolorizing in a very weak solution of hydrochloric acid. The blue is "brought back" by neutralizing the acid in a very weak solution of ammonium hydrate, 2 or 3 drops to 2 or 3 c.c. of water. When the stain has been regulated under the microscope, the tissue is allowed to wash in tap water (celloidin, 2 minutes; paraffin, half an hour). It is then ready for counterstaining with eosin. This is carried out by placing the tissue for a minute in distilled water, then in eosin for from one to five minutes, and washing in 35 per cent alcohol until the differentiation is satisfactory when the tissue is examined under a microscope. The section is then rapidly carried through the higher percentages of alcohol. In the case of paraffin, it is run through two changes of xylol, and finally mounted. With celloidin, beechwood cresote is used for clearing.

Fig. 26.—Longitudinal ground section from avitaminotic rat. (× 200; 16 mm. obj.; 8 × ocular.)

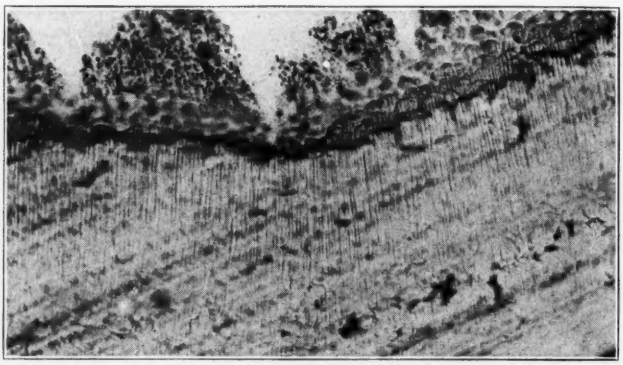

Fig. 27.—Longitudinal ground section of tooth from a normal rat. The caleospherites of forming dentin may be noted.

Fig. 28.—Decalcified longitudinal section of fourth generation from a young avitaminotic animal. (× 32.)

DIET

As J. C. Drummond[5] has clearly pointed out, there are apparently two different types of vitamins, the water soluble and the fat soluble. Of particular interest are the fat soluble vitamins, consisting of at least three different members.

Vitamin A has been found to promote growth and vitamin D plays some part in rickets and lime deposition. In diet 251, it is supplied through the irradiated lard. Vitamin E, the existence of which was demonstrated by

Fig. 29.—Section of the apical foramin of the animal from which the section shown in Figure 28 was taken. (× 90.) Apparently the tissue is normal, although it is somewhat late in forming.

5. Drummond, J. C.: Lancet, 1:272 (Feb.) 1926.

Evans[6] in California, and confirmed by Drummond, also belongs to this fat soluble class and plays an important part in reproduction.

Drummond states that, while there is no evidence of the chemical nature of this latter substance, the workers in his laboratory are satisfied that it is separate from either vitamin A or vitamin D.

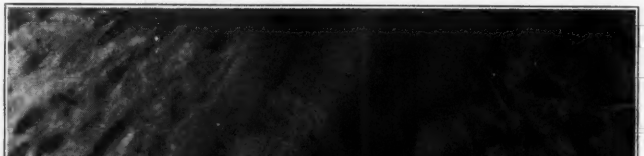

Fig. 30.—Area of pulp shown in Figure 29; normal tissue. (× 300.)

McCollum has clearly differentiated A from D by showing that the growth-promoting power of cod-liver oil is destroyed by oxidation, but at a different rate from that exhibited by the antirachitic vitamin D.

To Steenbock belongs the honor of conclusively demonstrating a new fact; namely, that a food mixture that produces rickets may be made antirachitic by exposure to ultraviolet light. In seeking an explanation for this phenomenon, at least two hypotheses are possible: either the food is made antirachitic through absorption and subsequent secondary radiation of ultraviolet rays, or else some constituent in the mixture is altered by the rays so as to render it antirachitic. The latter seems the more probable. By a process of careful elimination, it was found that either cholesterol or a substance almost identical with it, phytosterol, is apparently changed in such a manner that it becomes antirachitic in its properties.

It has been demonstrated by many experimenters in this field that animals on a diet deficient in vitamin A exhibit definite peculiarities in growth. It was thought advisable, therefore, at the outset, to keep a record of weekly weights

6. Evans, H. McL.: Science, 56:650, 1922; Evans and Bishop, K. S.: J. Metabolic Res., 3:201-231 (Feb.) 1923.

of all animals throughout the experiment so that there would be at least this evidence of vitamin A deficiency. On the basis of these weights, a series of growth curves, to be discussed later in detail, have been constructed, in which comparisons have been made between the normal animal and the vitamin A deficient animal. Furthermore, the averages for the different groups have been compared with certain individual animals which appeared to react abnormally toward vitamin A deficiency. Many of the vitamin A deficient animals exhibited the usual inflammatory conditions of the eye, as well as abnormalities in equilibrium reactions. A few gave evidence of lingual abscess.

Several different diets have been used from time to time, the formulas for which are given below, but the diet that has been found to be best suited for developing animals showing a deficiency of vitamin A is irradiated lard diet 251. The same salt mixture was used throughout.

The diets have been used by Evans and Burr and it is with pleasure that I acknowledge the publication courtesies that have been extended to me.

TABLE 1.—DIET 1 (MCCOLLUM): FOR NORMAL ANIMALS

	Per Cent	Gm.
Casein (uncooked)	15.0	1200.0
Whole milk powder	10.0	800.0
Sodium chlorid (pure)	0.8	60.0
Calcium carbonate (pure)	1.5	120.0
Butter	5.2	420.0
Mix well, then add		
Whole wheat (ground)	67.5	5400.0
	100.0	8000.0

Mix melted butter and casein first thoroughly; add milk and salts; mix; put through screens, and add whole wheat.

TABLE 2.—SALT MIXTURE 185* (MCCOLLUM)

	Per Cent	Gm.
Sodium chlorid	51.0	310.0
Magnesium sulphate (crystals)	159.6	960.0
Sodium phosphate (monobasic)	104.1	620.0
Calcium phosphate (monobasic)	162.0	970.0
Ferric citrate	35.4	210.0
Calcium lactate	390.0	2340.0
Potassium phosphate (dibasic)	286.2	1720.0

*Double quantity makes three and one-half cans of salts.

TABLE 3.—B. R.* 56

	Per Cent	Gm.
Extracted casein	18.0	540.0
Cornstarch (cooked)	54.0	1620.0
Salts (185)	4.0	120.0
Lard	24.0	720.0
	100.0	3000.0

*B. R.: basal ration.

TABLE 4.—DIET 251 (FOR VITAMIN A DEFICIENCY TESTS)

	Per Cent	Gm.
Casein (extracted with alcohol)	25	250
Corn starch (cooked)	69	690
Salts (185)	4	40
Lard (irradiated)	2	20
	100	1000
Yeast—daily		0.3

Kramer and Howland,[7] in 1922, sought to raise the concentration of calcium and inorganic phosphorus in the blood serum of rats, but were unable to do so either through diet or physical agents. The concentration of these elements could be lowered at will. They

7. Kramer, Benjamin, and Howland, John: Bull. Johns Hopkins Hosp., 33:313 (Sept.) 1922.

noted also that the effects of these deficient diets are sometimes accentuated in succeeding generations of animals so that a diet for one generation which is adequate as far as providing the normal amount of serum calcium is concerned

Fig. 31.—Decalcified section from animal shown in Figure 22. (× 16.)

may prove somewhat insufficient for a second generation, and in the third generation may be entirely inadequate.

Borst's[8] experiments in which rats were fed skimmed milk and diets poor in fat were complicated by the fact that parasites were demonstrable in some of the tissues. The question therefore naturally arises as to whether the changes in bone that he describes are attributable entirely to deficiencies in the diet.

COMMENT

A study of the animals has shown several outstanding characteristics, some of which have been previously described by other investigators, and others which, from the available literature, appear to be new observations. In this connection, it may be well to recall the results so far reported.

Simonette[9] studied the relation of the fat soluble A vitamin to growth and reproduction, and concluded that there is no absolute parallelism between the loss in weight and decrease in size due to deficiencies in vitamin A. In fact, growth may continue though the weight remains stationary or even decrease. This point has also been confirmed in this laboratory. Furthermore, the different parts of the skeleton are affected in varying degrees. The clinical studies conducted by Simonette show that the nature of the lesions, as well as the variations in the chemical composition of the organs during a vitamin A regimen, are quite different from those found in the experiments in underfeeding. The intensity of the disturbance produced is dependent on several factors, among which may be mentioned the composition of the diet immediately preceding the experiment, the degree of deficiency of diet, the age of the animal (older animals being

8. Borst, M.: Festschrift f. M. B. Schmitt, Centralbl. Gem. Pathol., 33:306, 1923.

9. Simonette, H.: Fat Soluble A in Relation to Growth and Reproduction, D. Sc. Thesis, Paris, 1925.

less affected) and the sex (females being more susceptible).

In Mellanby's[10] work on puppies, she has found that the development of teeth is subservient to factors other than calcium content in the diet. One of these factors is the amount of vitamin A and of another unidentified substance present in certain cereals.

Gross[11] reports that animals on a low vitamin A diet may exhibit a mild diarrhea, whereas those on a low vitamin B diet may give evidence of intestinal stasis.

Van Leersum[12] compared the microscopic pictures of rachitic rats with those of another group to which was administered hematoporphyrin, and reported that the deposition of lime following such an administration was remarkably similar to that found after cod-liver oil administration.

Fig. 32.—Section from pulp near floor of pulp chamber from animal referred to in Figure 31. (× 140.)

10. Mellanby, May: Influence of Light in Relation to Diet and the Formation of Teeth, Brit. Dent. J., 45:545, 1924.

11. Gross, L.: J. Pathol. & Bacteriol., 27:27 (Jan.) 1924.

12. Van Leersum, E. C.: Nederlandsch Tijdschr. v. Geneesk., 2:1931 (Nov. 10) 1923.

Bracco,[13] in 1923, fed rats on McCollum's diet 2911, and reported dental alterations consisting of a thickening of a portion of the dentin-forming organ. Within this tissue were enclosed small islands of partly formed dentin. In addition to this, there was a definite degree of pulp inflammation and pulp degeneration characterized by the formation of "calcospherites."

It is interesting to recall, in this connection, that Toverud,[14] in working with scorbutic guinea-pigs, noted degenerative pulp tissue, and found as well certain decreases in the chemical constituents of bone and teeth, as shown in Table 5.

The work of these two last experimenters has been confirmed in some of its details by this laboratory, as well as by the work of McCollum, Grieves and others on rachitic rats.

One of the many interesting statements which McCollum and his coworkers have made is that "caries-like lesions" were produced experimentally in their animals, as well as osteodentin. This has also been confirmed.

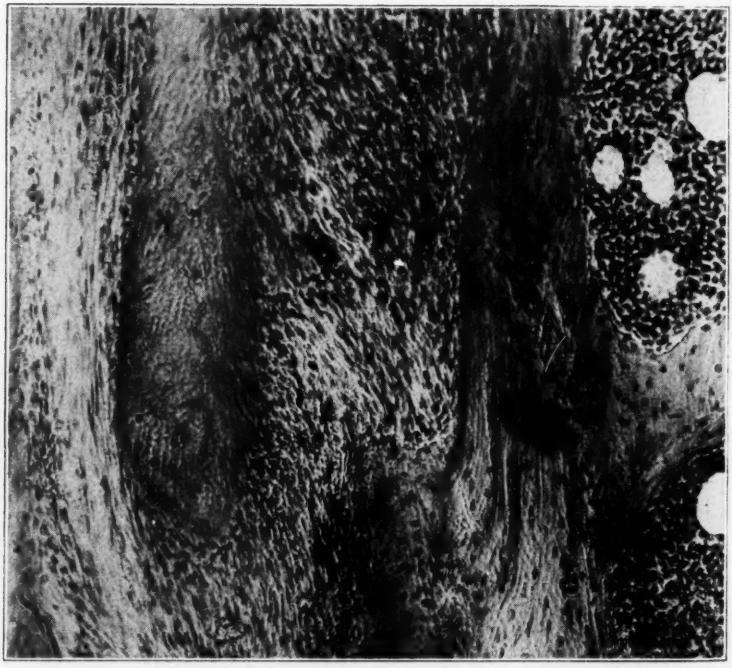

Fig. 33.—Periapical area from animal referred to in Figure 31. (× 140.)

13. Bracco, J. J.: Compt. rend. Soc. de biol., 89:453, 1923.

14. Toverud, J.: J. Biol. Chem., 58:583 (Dec.) 1923.

TABLE 5.—ALTERATIONS IN BONES AND TEETH IN SCORBUTIC GUINEA-PIGS

	Ash	Calcium	Magnesium	Phosphorus
Normal animals	78.6	38.7	1.31	
Scorbutic animals	73.8	35.1	2.78	
Animals on calcium poor diet	78.5	28.9	1.67	14.9

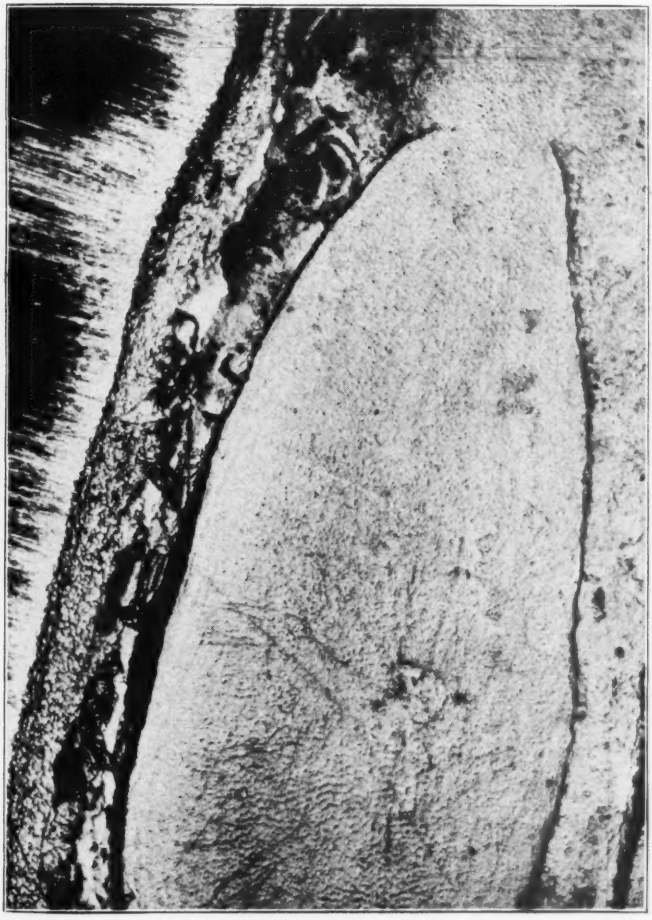

Fig. 34.—Longitudinal ground section of pulp stone and surrounding pulp and dentin from an avitaminotic female rat, aged 1 year and three months.

In addition, the sections demonstrate the presence not only of relatively large pulp stones but also, in other instances, of infected pulps and abscessed pulps. Some of the experiments have shown such a degree of degeneration that the caries of tooth structure included cementum as well

as dentin. These conditions are illustrated in the following pages.

In 1924, I reported some observations made on dogs that had been placed

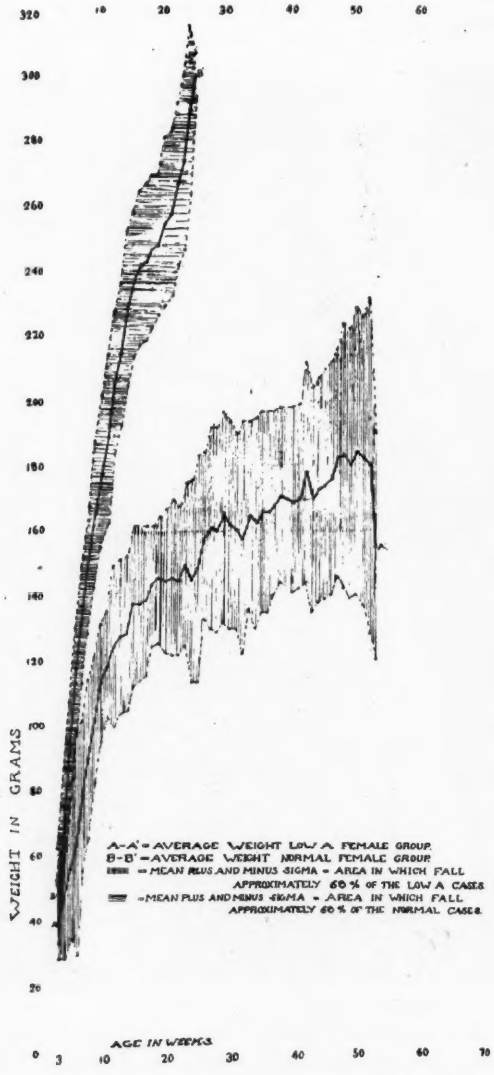
WEIGHT IN GRAMS
AGE IN WEEKS
A-A' = AVERAGE WEIGHT LOW A FEMALE GROUP
B-B' = AVERAGE WEIGHT NORMAL FEMALE GROUP
= MEAN PLUS AND MINUS SIGMA = AREA IN WHICH FALL APPROXIMATELY 68 % OF THE LOW A CASES
= MEAN PLUS AND MINUS SIGMA = AREA IN WHICH FALL APPROXIMATELY 68 % OF THE NORMAL CASES

Fig. 35.—Average growth curves computed from weekly weights of normal female rats and those on a diet low in vitamin A.

on various deficient diets. These animals showed several different types of enamel and dentin hypoplasia, conditions that were confirmed by Mel-

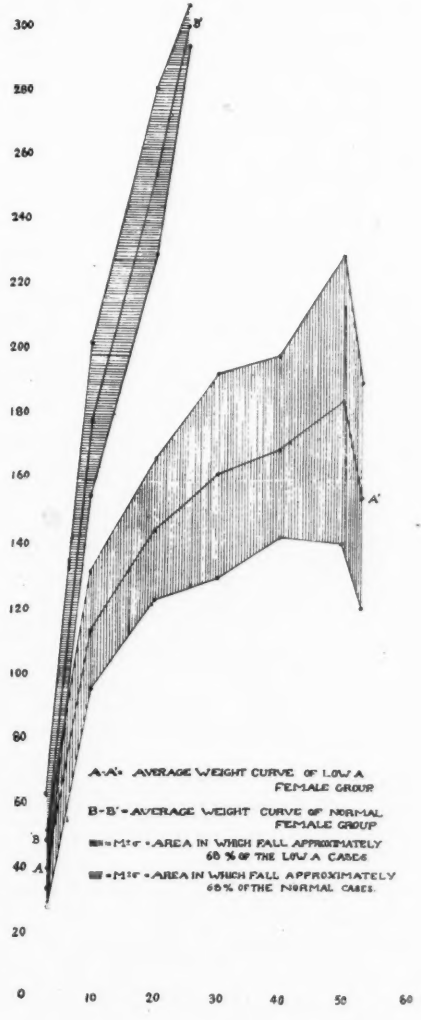

Fig. 36.—Average growth curves of group of animals referred to in Figure 35, recomputed at intervals of six weeks. The saw-tooth irregularities of the chart shown in Figure 37 tend to obscure the directions of the curves. This is corrected in the graph here shown.

lanby.[15] It is interesting to note that this type of dental abnormality has not been observed in any of the rats. Their teeth become carious, but not apparently from any gross defects in tooth

the rats is given as indicative of the type of lesions presented.

Rat 297, a female, 435 days old (approximately equivalent to 36 years in the human being) was given diet B. R. 56, plus yeast

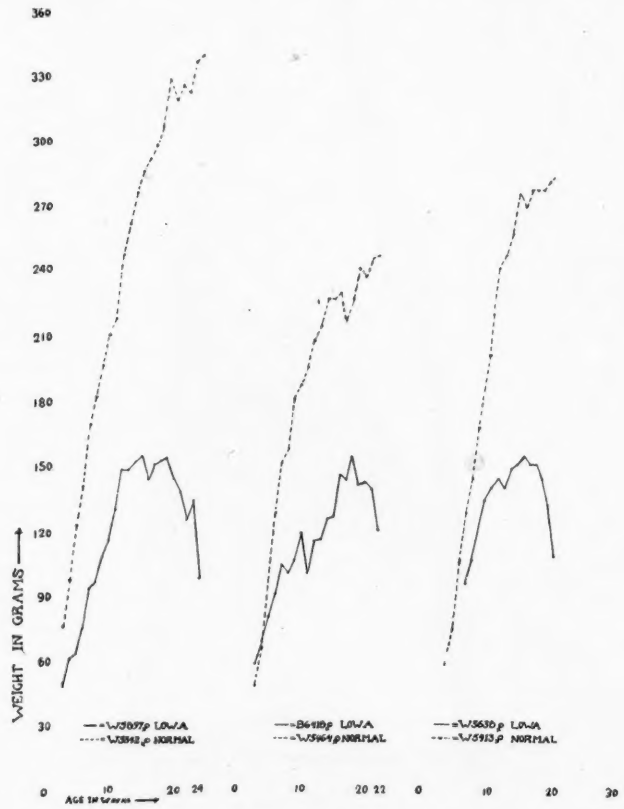

Fig. 37.—Individual growth curves of normal and avitaminotic rats.

formation such as were demonstrable in dogs.

The laboratory report of several of from weaning until death. At necropsy, the upper right first molar was decayed to the gum line. Microscopic examination indicates that the pulps had undergone degenerative changes to such an extent that necrotic areas are clearly shown. In other areas of the pulp, intense inflammation is present. The odontoblasts are not demonstrable.

15. Mellanby, M.; Pattison, C. L., and Proud, J. W.: Brit. M. J., 2:354 (Aug.) 1924.

Rat 308, a female, 375 days old, from the time of weaning was fed on B. R. 56, plus yeast (diet low in vitamin A). At necropsy, there was marked caries of the first and second right maxillary molars. There were small accumulations of tartar in the gingival areas of the other teeth. The decay process is clearly demonstrated in Figure 17.

Rat 226, a male, 134 days old was fed on diet B. R. 56, plus yeast from the day

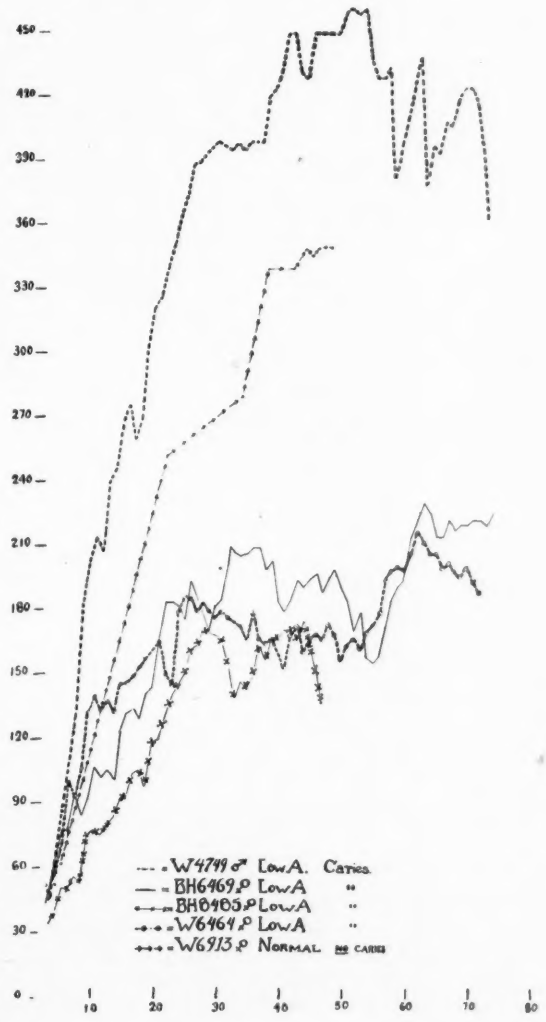

Fig. 38.—Individual growth curves of normal and avitaminotic rats. The group had developed dental caries.

weaned until killed. Although neither the examination at necropsy nor subsequent histopathologic study of tissues showed any definite carious areas, the pulps in these teeth were greatly inflamed and blood vessels distended to an unusual size. There was no evidence of odontoblasts.

When the bone of these older animals is compared with 31-day old ani-

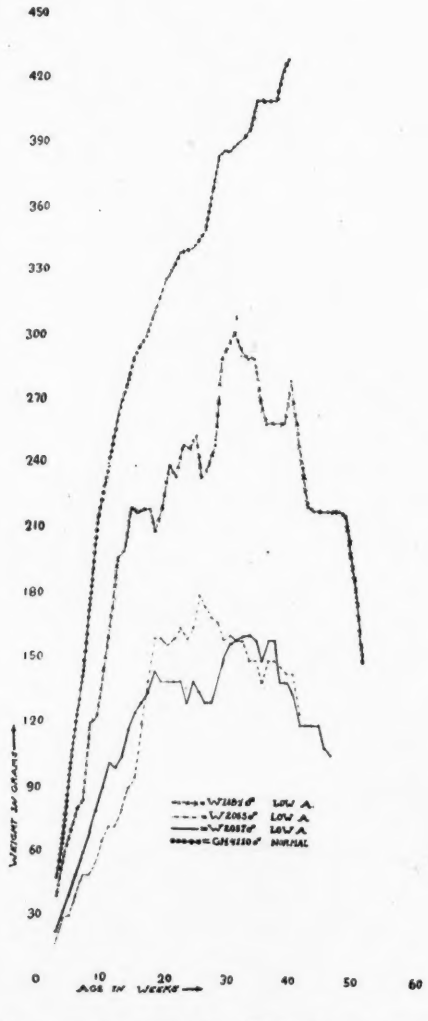

Fig. 39.—Individual growth curves of avitaminotic rats compared with those of a normal animal; ages between 11 and 12 months.

mals, it will be found that there is apparently no increase in degree of ossification, but if the animals fed on a diet low in vitamin A are compared, age and over, on a diet low in vitamin A. One other point deserves mention in this connection, and that is the relatively small amount of normally ossi-

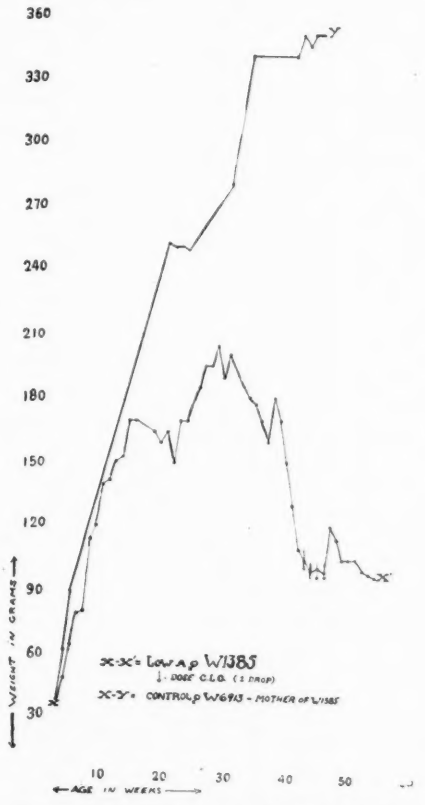

Fig. 40.—Growth curve of normal mother compared with a female avitaminotic offspring.

for age, with normal animals, the differences in this regard are very marked. This is shown, for example, in the examination of Rat 324, a normal female, 49 days old, on diet 1. The bone in this particular specimen shows approximately the same degree of ossification as is found in animals aged 120 days fied bone. In its place is fibrous connective tissue or abnormally large marrow spaces.

In one section of a first molar, a carious occlusal fissure was demonstrable extending almost to the pulp. In section 308-19, an enormous pulp stone has developed within the pulp

chamber, and the capillaries are shown extending on either side of it.

In addition to these protocols, it is of interest to compare the average weight curves of the normals and those intervals. It will be noted that the normal weights rise without showing any lag or plateau, whereas the A low group rise much more slowly after the twentieth week, and then, when the diet

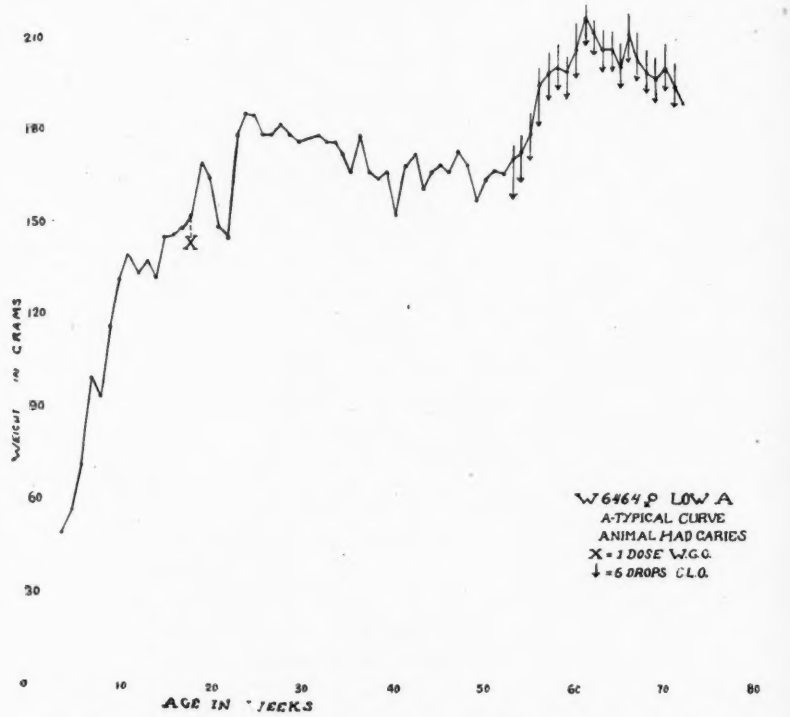

Fig. 41.—Atypical growth curve of animal on a diet low in vitamin A. The wheat-germ oil and cod-liver oil were administered in order to keep the animal alive.

of the vitamin A deficient animals. Figure 35 represents the average weights of normal animals and of females on a diet low in vitamin A, computed weekly. The general tendencies of these curves, which their sawtooth irregularities partly obscure, are shown in Figure 36. This is based on the average weights computed for six-week

is more completely restricted, drop quickly to weights less than half the normal animal. Figures 37 and 40 give a more direct comparison between normals and animals on an A low diet. These likewise show the typical curves. Figure 38 represents the weights of animals with carious teeth. It will be noted that the curve on the extreme

left is atypical even though the animal was on an A low diet. This particular rat had relatively enormous pulp stones in the pulp chambers of the molar teeth.

The growth curves of animals W-1384 and W-1385 in Figures 39 and 40 are of interest from another point of view. These animals, male and female, were litter mates, and their growth weights are somewhat similar in configuration. In both instances, the highest weight was reached during the thirtieth week. Ten weeks later, both animals showed a slight gain, but the male died at the fifty-first week. The weight of the female dropped so rapidly that a total of 4 drops of cod-liver oil was given during the forty-second week, one drop daily for four days. Although a slight gain in weight resulted, it was only temporary, and the animal was killed during the fifty-third week. The growth curve of the normal mother of these animals is given as the XY line in Figure 40.

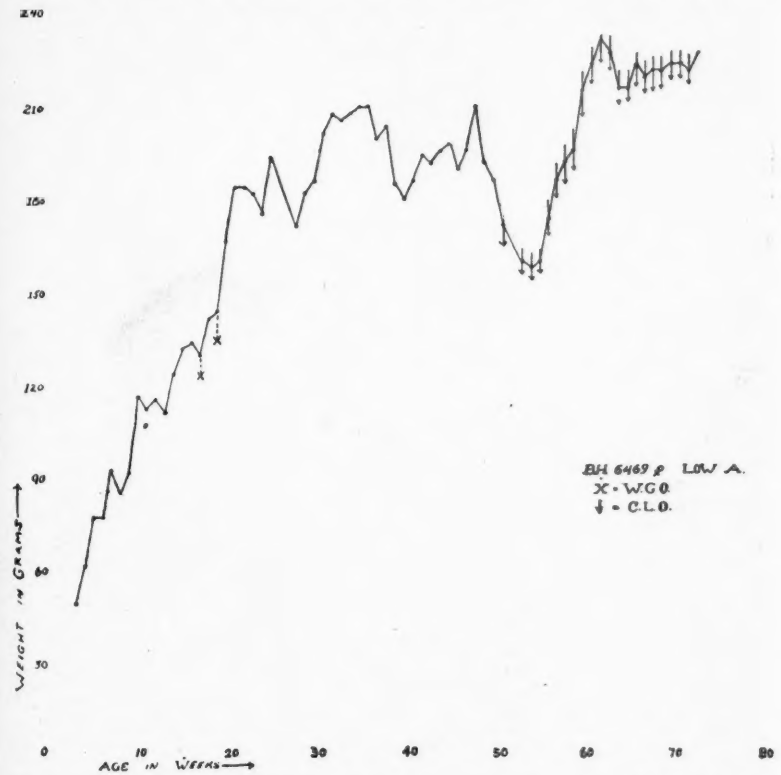

Fig. 42.—Atypical growth curve of animal, aged 72 weeks, on a diet deficient in vitamin A. Wheat-germ oil and cod-liver oil were given to keep the animal alive.

Not all of animals on the A low

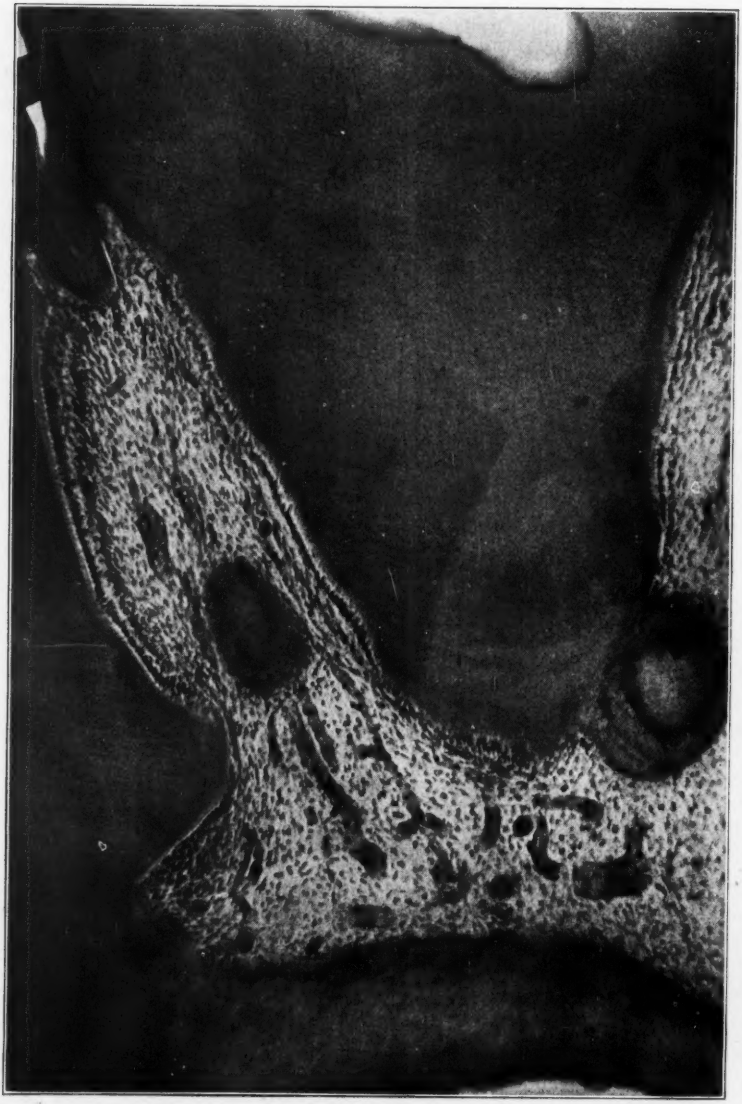

Fig. 43.—Pulp stones in substance of pulp as well as on wall of canal. Odontoblastic layers may also be noted.

Fig. 44.—Inflamed pulp and degenerating alveolar bone.

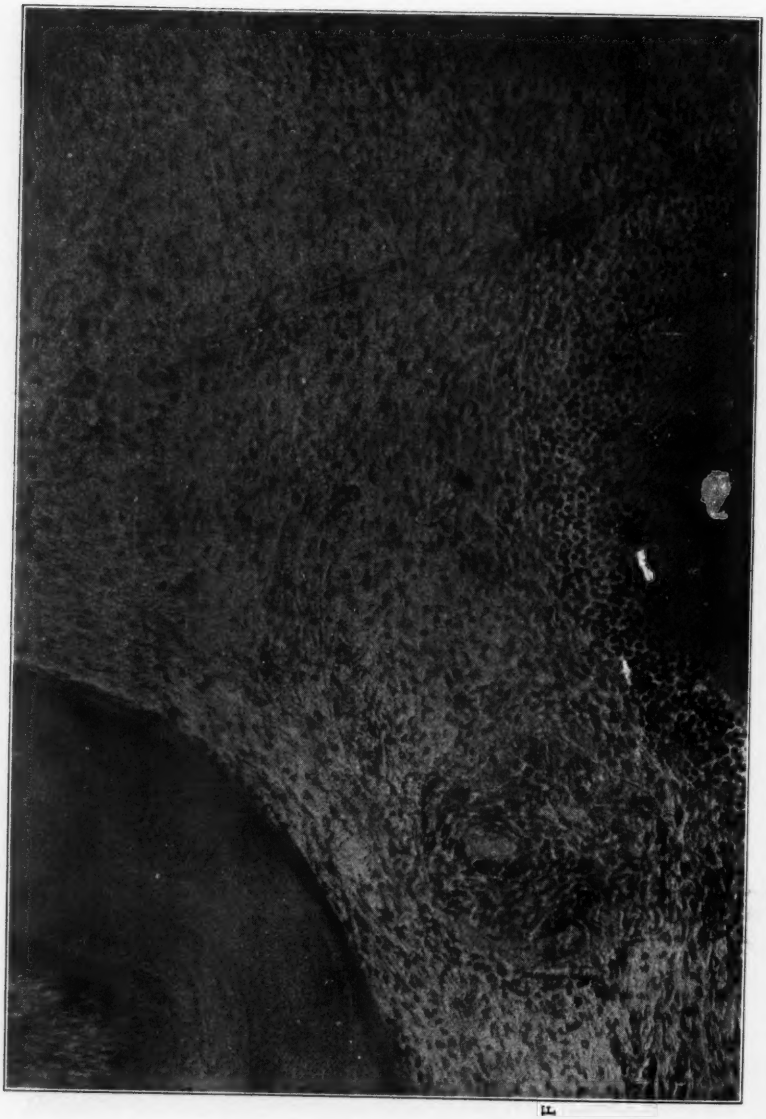

Fig. 45.—Pulp stone in process of formation (opposite *F*) may be noted.

diet show the same growth deficiencies. There were some that apparently were able to withstand the diet without losing so much weight. These naturally have atypical curves (Figs. 41 and 42). The animal whose weight curve is plotted in Figure 41 showed dental caries at necropsy. At 13 weeks, the animal was given one drop of wheat germ oil (ether extracted). The weight promptly rose, and then fluctuated until about the fiftieth week. Then it rose again steadily, as a result of addition of cod-liver oil, until the sixty-second week. This dosage was necessary on account of the weakened condition of the rat. Finally, even the further addition of cod liver oil failed to prevent the rapid loss in weight, and ultimate death.

SUMMARY

1. Caries has not been found in young animals, even those of the third generation, from parents on a diet deficient in vitamin A. After maturity has been reached, caries develops.

2. The experimentally produced caries is more nearly similar to that found in adult man than in the child or the adolescent.

3. Pulp lesions, such as pulp abscess and pulp calcification, are demonstrable in teeth that do not show caries as well as in those that do.

4. The average growth curves for all the experimental animals indicate typical vitamin A avitaminosis.

5. All the animals do not respond to the same degree to the deficient diets.

6. Without regard to growth weights, rats, both male and female, on vitamin A deficient diets, develop dental caries after maturity has been reached.

7. Up to this time at least, the dental defects observed in dogs on deficient diets are not comparable to those reported on rats, for neither enamel nor dentin hypoplasia have been found.

8. A relatively high degree of attrition and abrasion of tooth surface occurs both in normal rats and in those fed on diets deficient in vitamin A, a condition that may or may not have some bearing on the development of carious processes in the second group of animals.

9. Up to the present, it has not been found possible to alter or arrest caries when an animal previously on a vitamin A deficient diet is fed vitamin A at a later period.

PROCEEDINGS OF THE SEVENTH INTERNATIONAL DENTAL CONGRESS*

PHILADELPHIA, PENNSYLVANIA, AUGUST 23, 1926

THE ceremonies of the Seventh International Dental Congress were opened at 8:30 o'clock, Monday evening, Aug. 23, 1926, by the President, William H. G. Logan.

The President: The Seventh International Dental Congress will be opened with an invocation by the Reverend William Agnew.

The Rev. Mr. Agnew: Almighty and everlasting God, author, alike distributor of all good gifts, deign to look with favor upon this gathering of Thy children, distinguished servants of Thy larger families, their fellowmen in every land. By the inspiration of the Holy Ghost, instruct their minds and hearts to know and embrace all that is right and just and guide their deliberations and discussions through thoroughness, frankness and friendliness, to the adoption and promotion of methods of education and professional practice, which shall guarantee to humankind the most salutary service which the profession of dentistry has deigned to bestow. We ask this favor through the name of Jesus Christ, Thy Son, our Lord and Savior. Amen.

The President: Fellow Officers and Committeemen, and you, Sir, the Representative of the Government, Honored Guests, Representatives, Official Delegates from the Various Nations, Members, Ladies and Gentlemen: On this occasion, naturally, my first words should be directed to the members and guests from other nations. Therefore, permit me to remind you that we have assembled in a city where your countrymen and my countrymen, a hundred and fifty years ago, founded a new nation, which was not to depend alone on its own efforts and that of its descendants, but also on the labor and wisdom of men and women from many lands, without which we could not have flowered into greatness.

We have met at a gateway of a country where your countrymen and mine have founded an empire from the prairies and forests in that westerly direction which the star of empire ever takes. We have gathered beneath that flag which has united millions of colonists, from across the seas in the great task of taming the wilderness, of harnessing the water falls, of rearing cities and building churches where each was to be permitted to worship in accordance with the dictates of his own conscience.

In the assembly here about me are delegates from almost every civilized nation in the world, each bringing from

*Combined program of dinner given by the government of the United States in honor of visiting delegates to the Seventh International Dental Congress, and first general meeting of the Seventh International Dental Congress.

his own land his meed of achievement to lay on the common altar of dental science. In the country around me and beyond me, the sons and daughters of the same people in the days gone by came to our shores with their traditions, their youth, their industry and their achievements to lay on our national altar. This international convention is but a miniature of our national civilization. The very names you bear are borne by countless thousands on the farms, in the hamlets and in the cities, north, south and west, from Philadelphia to the Pacific Ocean, from the Great Lakes to the Gulf of Mexico. The blood that flowed in the veins of your forefathers is still flowing warm in the veins of our fellow Americans, and will continue to do so in their children and their children's children, for all time to come.

Friends from all countries, it is no strange land to which you come. It is that land which is the common heritage of all nations, for here, a hundred and fifty years ago, the Frenchman, the Briton, the Scot, the Celt, the Norseman, the Dutchman, the German, the Spaniard, and the native from the Alps and the Mediterranean all sat in serious deliberation in the first continental congress. Today, their offspring sit in the seats of power at Washington, to guide the destinies of that nation which I hope that I have your approval to term tonight, not your country, not my country, but, if you please, our common country.

In the name of the officers and committeemen of the Seventh International Dental Congress, I greet and bid you welcome, and ask the privilege and honor of now introducing to you the representative of the State Department of the United States Government, who has been permitted by our President, Calvin Coolidge, and by legislative enactment in the House and Senate assembled, to appear here tonight and extend his nation's greetings to the delegates of the world here assembled. Ladies and gentlemen, the Hon. J. Butler Wright will now address you.

Mr. Wright: Mr. President, Messrs. Delegates, Mr. Senator, Ladies and Gentlemen: It is indeed a pleasure and a privilege that has been entrusted to me by the President of the United States and by my chief, the Secretary of State, to extend to you the most cordial and heartfelt greeting on the opening of this important conference.

As the President has so appropriately remarked, the occasion of my participation in this conference finds its genesis in the fact that, by due appropriation and legislation, the Government of the United States was able to extend the invitation, which it did so eagerly. Even had that not been the case, it might have been the privilege of a representative of the Department of State to knock at the door of this conference, in order that he might improve an opportunity of explaining why the Government of the United States is so interested in matters of this nature. Of course, we realize the appropriateness of this gathering, which means so much to humankind, here in Philadelphia on the one hundred and fiftieth birthday of that nation, which, as the President of this conference has said, is truly a nation in which we all may take pride. The interest in this conference is universal, for I understand the membership is more than 42,000. Therefore, the official participation of the Government of the United States in this conference reflects its interest in matters

pertaining first to international welfare and second to dentistry.

Why is the United States so interested in this matter? I think that we may point with certain pride to the fact that the United States Government has always been a pioneer, or certainly an ardent collaborator, in matters of public health, happiness and hygiene. Its interest is also shown in the progress made in the care and preservation of the teeth in the departments of Army and Navy and the Public Health Service, also in schools, and in the widespread information and instruction given through the medium of the press and of advertisements.

I had the pleasure of participating as a commissioner in an exposition held in Rio de Janeiro, three years ago, in which one of the most important factors was the exhibition of moving films, and I remember that one of the films which commanded the most interest of those who came to that exposition depicted the efforts made in the care and preservation of the teeth.

I should say, further, that no one whose cross it perhaps was, or perhaps whose privilege it was, to see the ravages of the great war could fail to be impressed by the lessons and the triumphs in plastic surgery in which dental surgery played so important a part. I speak as an absolute layman, and yet no layman could fail to be impressed by those triumphs, which not only inured to the happiness or the relative perfection of the physique of the individual, but had done so much to relieve them from that curse of unsightliness—those awful figures which, without the triumph of plastic and dental surgery would have gone through the world and through life as behind a screen, afraid to show their dismembered faces and distorted countenances, notwithstanding the fact that they had suffered disfigurement in a cause which they considered right.

I have also been impressed by the application of dental hygiene at army posts, in warships, in schools, in factories throughout this country, and I believe that at the Sesquicentennial Exposition and at the exposition at the Commercial Museum, there is the most graphic depiction of the triumphs of dental surgery, we will say within a measurable space of time and also within a much shorter period.

Being aware of the fact that the United States is all too frequently criticized as a materialistic country, whose accomplishments are expressed in terms of dollars and cents, if I turn to the more or less commercial or economic side of the picture, let me venture to call attention to it from the standpoint of economics and commerce, happily blended with an effort to ameliorate the condition of the human race rather than to consider merely a question as to how much money is involved therein. As an evidence of the interest which the government of the United States takes in matters of this kind, I have been able to glean from governmental sources the following figures, some of which may be familiar to you, but nevertheless spell a total which I should wish to emphasize, and, I repeat myself here, not from the standpoint of the financial benefit which inures to this country, but perhaps as an interpretation of what science is endeavoring to accomplish along the lines in which you gentlemen are engaged.

In 1922, the United States exported $179,000 worth of dental instruments,

$303,000 worth of teeth, $948,000 worth of office equipment. In 1923, the figures were higher, $132,000, $291,000, and a million and a half.

In 1924, they were still higher, $132,000 again, $1,000,000 and $1,200,000.

In 1925, the figures were $1,283,000 in dental instruments, $1,150,000 in teeth, and $727,000 worth of dental office equipment; the totals for the years reading: $1,400,000, $1,900,000, $2,300,00 and $3,100,000 worth of exports.

The subject viewed from that approach is, therefore, ladies and gentlemen, of interest to the United States not only from the standpoint of a recital of commercial enterprise, but also on account of the health of the members of its foreign service and of that part that it plays in establishing the contacts which are so necessary.

It would seem almost facetious if our representatives abroad who are engaged in the protection of your interests are not themselves the beneficiaries of the progress of science which you gentlemen have marked, their spirits being not sufficient to withstand the strain of continued residence in unhealthy climes; and, if that be the case, it must have an effect on their physique, and the effect on their physique and spirits must have an effect upon the contacts which they make.

Therefore, and without unduly transgressing on the grounds of the committee, I should like, on their behalf, cordially to invite the continuation and enlargement of the education of foreign students in American dental schools. Let us interpret the sentiments to which the President has already alluded by opening our doors even more widely than you of Philadelphia have done in this instance, in order not only that anyone may come to learn from us but also that we may have even the greater pleasure and privilege of learning from them; and let us express the hope that this intimate knowledge of our methods and the regulations born of this congress may, in time, lead to universal adoption of laws concerning the admission of foreigners to practice in all countries, which will further place at the disposal of all the people of the world the triumphs and discoveries and accomplishments of this profession as they are brought to light by those who so earnestly practice it.

Mr. Wright, speaking in French and again in Spanish, welcomed the delegates from other countries.

The President: I am at this moment permitted to announce that we have a member of the American Dental Association who is a United States Senator from Minnesota, and who was a great aid in making it possible for the government to take part officially in this evening's program. Therefore, it is with pride that our profession calls to this platform one of its members, Senator Henrik Shipstead of Minnesota.

Senator Shipstead: Mr. President, Honored Delegates, Mr. Secretary, Ladies and Gentlemen: I have the honor of appearing at this congress as a delegate appointed by the chairman of the Minnesota delegation. I want to say in addition to what Mr. Wright has said and what the President has said to these delegates from foreign countries that we of America are not unmindful of your contribution to our learning, to our culture, to our national life. We have inherited many things from you. We are of the same flesh and blood as

you are. We hope that in return for what you have contributed to us, this country, still in its youth, shall, in the future, be able to pay you back in kind.

I beg you delegates representing the various governments of the world, when you are guests in this country, when you travel through this country, to remember that in the comparatively short space of one hundred and fifty years, this country has developed from a wilderness to the country that it is today. It is still in its youth, and because we are young, we sometimes feel that we have the temperament of youth, and we ask you to understand us.

It is a very significant historical fact that the last international congress that was held prior to the last international unpleasantness was that of the International Dental Federation, and the first international congress of any kind, of which I am aware, since the last war is this international dental congress. It shows that science and scientific men are the last to go to war and the first to gather under the blessing of peace.

Since the question of the eradication or elimination of preventable diseases was placed upon a scientific basis, scientific men all over the world have rendered a great service to humanity by learning of and having learned the cause of disease, and eliminating or preventing disease by removing the cause. I hope no one will take umbrage when I say that I hope the day will come when the statesmen of the world will emulate their scientific brethren and scientifically study the causes of that worst disease that has afflicted humanity, the disease we call war, by learning of its causes and abolishing it by eliminating the cause after it is found.

I dare to hope the day will come when by eliminating the cause they will bless humanity by permitting humanity to escape its horrors and then thereafter enjoy the blessings of peace.

A gathering of this kind cannot but be helpful to the promotion of international good will. We hope that you delegates from foreign nations when you go home will have a better understanding of the United States and our people. We hope that we shall understand you better because we have seen you.

When my country and my government has the honor of your presence and has the privilege and pleasure of entertaining you, we honor ourselves.

May I say, in conclusion, that I hope that this international congress will be followed by many, that the promotion of science may continue to bless humanity and that good will among the peoples of the earth shall be promoted so that all men wherever they may be upon the face of this earth shall live together upon this earth in harmony and in peace.

The President: Your Chairman is now granted the pleasure of calling before you a man who, for a quarter of a century, has been associated with dental educational problems as an executive and as a teacher, a member of the Dental Educational Council of America and now has the distinguished and appropriate honor of being President of the American Dental Association, Dr. Sheppard W. Foster of Atlanta, Ga.

Dr. Foster: Mr. Chairman, Honored Guests, Distinguished Representatives from our Government, Ladies and Gentlemen: As the official representative of the American Dental Association, I take pleasure in extending greet-

ings at this time. As has been stated, we have assembled here to inaugurate the opening of the seventh meeting of this International Dental Congress. This congress will, in all probability, register the greatest gathering of dentists ever assembled. You have honored America in coming to us from every quarter of the globe, from the North, from the East, from the South and from the West. Some of you, we know, have made this journey at great sacrifice. Your coming and the sacrifices you have made demonstrate your deep interest in this meeting and your earnest desire more efficiently to contribute to the advancement of this noble profession and to the welfare of humanity.

This great historical city of Philadelphia with her Sesquicentennial Exposition welcomes you. Our Government, the great United States of America, has extended you her welcome and her hospitality.

The 35,000 dentists, members of the American Dental Association, bid you thrice welcome and extend to you the right hand of fellowship, of friendship and brotherly love.

It is indeed a pleasure to be able to bring to you at this time fraternal greetings. While we extend to you every hospitality, we must confess that there is in part an underlying actuating selfish motive. We know that by your contact with us, the resultant interchange of ideas and friendships, we are to be the real beneficiaries. If American dentistry has achieved anything which is of value to you, we want you to appropriate it. What we have is yours in unstinted measure for the asking.

As the distinguished representative of our Government states, approximately twelve years have elapsed since the last meeting of this congress was convened in the great city of London. Since that time, probably no history of the world has recorded such stirring events as have been registered.

Within this period, notable advances have been made in all lines of art and science, but nowhere has there been greater progress made than in the science of dentistry.

The representative of our Government called your attention to some of the wonderful accomplishments in plastic surgery. I want to repeat that, in the field of maxillofacial surgery and surgical prosthesis, truly marvelous transformations have been achieved during this time.

In the field of dental science and research, wonderful progress has been made. No department of the health service has contributed more to the welfare of mankind during these twelve years than has dentistry.

Your President, Dr. Logan, will discuss with you the development of dental education in America, following close in the wake of the development of dental colleges in the United States of America and probably second only in its influence to that of organized dentistry.

The first dental association was organized in the city of New York in 1840. It was known as the New York Society of Dental Surgeons. For political and social reasons, this association functioned but a few years. It was, however, the forerunner of the American Dental Association, which was organized in Niagara Falls in 1859, and which we have the honor to represent at this time.

The history of the development of dentistry is most interesting; the development of dentistry in America is most interesting. It was rejected by our mother profession, medicine. This rejection proved long since to be a blessing in disguise. It forced a few men in dentistry, men who had a vision, men with an indomitable will, men with the courage of their convictions, to digress from the usual march of progress and to proclaim and demonstrate to the world that dentistry was of sufficient importance to the welfare of mankind to entitle it rightfully to a place as an independent profession.

This digression in the plan of dental education has placed a stamp on American dentistry for its efficiency of which we are all proud and to which the attention of the world has been attracted. The American Dental Association which extends to you greetings tonight is the largest organized body of dentists in the world. It has the largest membership per capita of all professional organizations. Its membership now registers more than 35,000 names. Organized sixty-seven years ago, it has had a remarkable record. This great association has passed through the pestilence and horrors of war both civil and international and has continued to function without interruption with the exception of one year during the Civil War.

In 1867, the Southern Dental Association was organized in Atlanta, Ga. This association had for its purpose the same ideals for which the American Dental Association stood.

At a meeting of these two associations at Old Point Comfort, Virginia, in 1897, it was deemed wise in the interest of efficiency and to attain a greater potential influence, that these two associations, both national in character, be consolidated.

This amalgamated association chose the name of National Dental Association. It functioned under this name until the annual meeting in Los Angeles, Calif., in 1922, when, happily, the name American Dental Association was again adopted.

Under the plan of the present organization, membership can, with but isolated exceptions, be secured in the American Dental Association only through state or constituent societies. In this country, the American Dental Association is the greatest influential factor in all matters affecting industry. It sponsors and finances such committees as are commissioned to carry forward all progressive movements in the advancement of dentistry. We are now contributing approximately $30,000 annually to research. Nowhere has there been greater contribution made to science from the standpoint of health during recent years than has been made by the members of the American Dental Association through their research laboratories.

It has been largely through their findings that not only the medical profession but also the world has been made to appreciate the important close relationship between mouth infection and systemic disease. Through the influence of the profession in matters pertaining to legislation, Congress and the Senate of the United States have seen fit to accord to dentistry the same rank and dignity as is given to the medical profession.

Only during the last Congress a bill known as the Equalization Bill was passed by both houses and signed by the

President of the United States, which places the officers of the naval corps on an equal footing in matters of rank and promotion with other line officers.

In matters of education, the American Dental Association finances the Dental Educational Council of America, another commission functioning in the interests of dental education.

One of the activities of the American Dental Association which probably is spreading more sunshine and happiness than any other is the Relief Commission. There is now in the treasury of the relief fund of the American Dental Association more than $165,000 from which funds are being drawn for the support of disabled and dependent members of this Association. In current dental literature, THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION stands today without a peer in America. It has the largest paid circulation of all journals of like character.

For your special information I might say that it required twenty-six tons of paper to publish the current (June) issue of THE JOURNAL, which carried the preliminary program for this congress. In addition to other valuable features it carries a department of dental health and education. This department covers approximately fourteen to twenty pages of each issue and is far-reaching in its influence. It deals largely with preventive dentistry, and the influence of mouth infection on the health and development of the school child.

This, in a brief way, ladies and gentlemen, gives you a brief history of organized dentistry in America, particularly the history of the American Dental Association and some of its contributions to the welfare of humanity.

Once, more, on behalf of the American Dental Association, we bid you welcome. May your sojourn with us be mutually pleasing and profitable, and, when you return to your respective homes, may you have the feeling that this meeting has been a great contribution to the welfare of mankind. This is our sincere wish.

The President: This international convention is indebted not only to preceding congresses and the executive officers of the International Dental Federation but also to a number of efficient workers who have given liberally of their time and wisdom about the consultation table, and one of the outstanding members of this group is the individual whom I now have the opportunity to call to the Chair to preside. This gentleman is an educator of recognized ability and is at the present time dean of the Dental School of the University of Pittsburgh, which has the largest enrollment of all institutions in the United States. He has given outstanding services as a member of the Dental Educational Council of America for about twenty years and is now president of the American Association of Dental Schools. He is a former president of the American Dental Association. Ladies and gentlemen, the Vice-President of the Seventh International Dental Congress, Dr. H. E. Friesell, will now take the Chair.

Dr. Friesell: Fellow Officers, the Hon. J. Butler Wright, Senator Shipstead, Members, Guests, Ladies and Gentlemen: My particular pleasure in participating in this program this evening is in the honor of introducing to this audience the distinguished President of the Seventh International Dental Congress, Dr. William Hoffman

Gardiner Logan. I need not tell you that Dr. Logan has achieved the highest public distinction in his profession. He is a former president of the Chicago Dental Society, and of the Illinois State Dental Society, the largest component and state dental societies in existence. Also, he is a former president of the American Dental Association. He too is a prominent member of the Dental Educational Council of America and is president-elect of the American Association of Dental Schools. Likewise, he is dean of the Chicago College of Dental Surgery, and he has been active in all forward movements in dental education. During the World War, Dr. Logan was a colonel in the medical corps and, from the Surgeon General's office, was charged with the problem of originating and building up the dental reserve corps in the army and also of directing the service of this corps as chief of the division under Surgeon General Gorgas. As to his executive ability, I have only to refer you to the rules and regulations of this congress which he inaugurated, thus introducing a new idea into dental congresses, the unit plan, which has resulted in paid memberships in this congress of between 35,000 and 40,000, by far the greatest enrollment of all dental congresses that have been held.

Dr. Logan's capacity for infinite detail is largely responsible for the smooth working of this stupendous dental gathering.

Ladies and gentlemen, Dr. Logan will now address you.

DENTISTRY: ITS TRADITIONS AND RESPONSIBILITIES

By WILLIAM H. G. LOGAN,† M.D., D.D.S., Chicago, Illinois

AT the formal opening of this great body, it might seem appropriate to discuss many problems connected with world dentistry, but the limitation of time renders it necessary to refer briefly to only a few of them.

You have been welcomed, on behalf of the President of the United States, Calvin Coolidge, by the Hon. J. Butler Wright, and on behalf of organized dentistry in this country, by Dr. Sheppard W. Foster, President of the American Dental Association, the representative dental body of the United States. Dr. Foster has dealt with the development of dental association work. Therefore, it remains only for me to emphasize your welcome and invite your attention to another important phase of our professional activity, the question of dental education.

The origin of dentistry as a profesSon can very appropriately be designated as the date of the founding of the first dental school, in Baltimore, Md., because the basis of all advancement in any profession or calling reverts back to the fundamentals of its educational system. It would seem imperative, therefore, for these world congresses to weigh our educational methods and study these problems with increasing care. The history of any important movement or vast achievement tells the story of its utilitarian value as a human

†President of the Seventh International Dental Congress.

enterprise. If there is pronounced and prolonged demand for any profession, product or policy, it is conclusive evidence that there is inherent virtue in it. Therefore, it seems quite appropriate to refer here and now to the different and rather varied systems of dental education in vogue throughout the world, with special reference to the United States and Canada, or the one with which I am most intimately acquainted. Yet there is not the slightest intention to make invidious comparison or to arrogate to any section or country superiority over other sections or countries; but the outstanding fact must be apparent: that there is a decided difference of methods, which it is our duty as a profession to consider with great care; otherwise, progress may be retarded.

In certain countries, dental education has been under the direct guidance, and, on occasion, under the domination of the medical profession; while, in others, it has been sponsored and, on occasion, dominated by dentists themselves. This is notably so in the United States and Canada, where dental education has been almost wholly evolved and carried on by dentists. It is not our wish, in a splendid international gathering such as this, to make claims of special virtue for any system; but it is at least important, if we are to profit, to point to results.

If it is true that the pronounced demand for a thing is evidence of its value, there must be some merit and virtue in the Canadian and United States' system of dental education, in view of the fact that today more than half of the dentists of the world are located in North America, where the demand for their services is in an ever-increasing ratio to the population, and where their status is rapidly assuming a like importance in the eyes of the people with that of other learned professions.

No system of education can be wholly wrong which creates such a demand as we have seen in this instance. All human endeavor must, in the ultimate, be judged by its intrinsic value in the service of mankind, and, after eighty-six years of practical experience, the North American idea of dental education cannot be classed in any broad sense as a failure.

The development, in that time, from a profession without a teaching institution of its own to one with nearly fifty of the class of colleges which are in operation today, is a demonstration without equal in the history of professional education. In this view of the case, there can be no argument when a comparison is made between a policy of medical domination and one in which dentists and the teachers of the sciences and medicodental subjects, under the guidance of the university trustees, have been permitted to direct their own educational problems.

This, of course, does not in any sense imply that there shall not exist at all times after graduation the closest cooperation and consultation between the medical men and the dentists in all of those disease conditions in which their functions overlap and which affect the welfare of the people. But in problems connected with the education of dental students, the plans and policies of properly educated and well-trained dentists are safer to follow in most instances than are those of medical men.

In America, at the present time, there is much discussion as to the necessary preliminary educational require-

ments and curriculums in our dental schools. For some years, the minimum requirement for graduation, as laid down by the Dental Educational Council of America, has been four years in a dental school after graduation from an accredited high school, or a total of sixteen school years. But, beginning with the present year, all students must have at least one year of specified university work and four years of dental training, or seventeen years of instruction. This last plan has had a test of five years on the part of a few universities in Canada and the United States.

Another plan, which was given a trial for the first time last year by one school, requires two years of specified university work and three years in the dental school. This has been known as the two-three-graduate plan, the first as the one-four, and both equally five years from the high school, or a total of seventeen years. And finally, a few of our universities have announced that, beginning in 1927, they will require two years of specified university work and four years in the dental school, or a total of eighteen years, from entrance into the primary department to graduation from the dental school.

The best minds in the profession of North America are working on this problem, with assistance from other agencies, notably the Carnegie Foundation and the Dental Educational Council of America, and what the ultimate plan will be no one at present can definitely predict. Yet with all the study, deliberation and experience that is necessary, it will undoubtedly take a decade before the best plan for dental education in this country can be definitely settled.

There is one thing that should be constantly emphasized in dental education: The practice of dentistry requires two attributes: a scientifically trained mind and manual dexterity. It has been charged, in some quarters, that dental educators in this country have concentrated on the latter at the expense of the former, and, to some extent, in certain instances this has been true. But there is nothing more fundamental in connection with the problem of dental education and practice than the fact that to give a student all the scientific knowledge available and leave him without the manual skill properly to execute his ideas on the prospective patient will result in lamentable failure, a practitioner with knowledge but without the ability to apply it.

To develop skill, except with those highly endowed in this respect by Nature, the student must begin young enough to be amenable to training, and the technical part of his instruction must be carried along in logical ratio with his cultural and scientific studies. Whatever plan of dental education may be adopted, the two-three-graduate, the one-four or the two-four plan, one thing seems apparent, that, with our present breadth of development in the science and art of dentistry, at least a minimum of five years must be given to the training of the dental student after he is qualified to enter the university. Just how these five years may be employed to the best advantage is a question to be finally worked out in the crucible of practical experience, and I for one have full confidence that with the active interest of so many great minds a most effective plan will prevail.

The details of teaching methods of course cannot be considered at this

time, but it would at least seem appropriate to refer briefly to the serious obligations which rest on every man who accepts the responsibility of instructing professional students. Even with our present plan of demanding at least one year of university work for admission to a dental school, these young men come to us at an impressionable and receptive age, and there is a moral obligation connected with teaching which cannot be ignored. It is important that, in the period allotted, we impart all the essential cultural and professional knowledge in our power, and that we have the closest supervision over their professional training. We owe it to the public and our profession to foster in these young students a spirit of research and investigation that they may develop the habit of study and observation. We must insist on the adoption of the right ideals of professional life and show them the fundamental difference between that kind of life and a life of purely business occupation or enterprise.

All of these things are essential in the plan of dental education, but, above and beyond everything else, there is something which is seldom considered, but which is of paramount importance. It matters much whether we make good dentists in our college courses, but it matters more that we make of them good men and good citizens of the world. There seems to be an attitude on the part of many teachers that their function is fulfilled when they achieve success in imparting theoretical and technical instruction. They apparently assume that all teaching of character, morals and patriotism belongs to other agencies, the home, the church and the government. But the insistent fact stands out in all eloquence that no man should aspire to the position of a teacher who ignores his broader duty and his moral responsibility in endeavoring to mold and shape the characters of those who come under his instruction. The man who neglects his precious privileges in this respect, who fails to take advantage of the great opportunities which constantly present in college work, has no place as a teacher in the professional school. It is one of the most important of all his functions as an instructor and one which, if ignored, makes him disloyal to his high calling.

By this, it is not meant that a dental teacher should make it a rule to moralize constantly with his class. In fact, any such practice is wholly out of place; but he should, by his daily life in all its relations, set such an example by right living and professional rectitude that his students, during this impressionable period of their lives must, in the very nature of things, absorb those principles of character and idealism which will go farther than any other teaching agency in making of them the type of professional men the world most needs today, and combating the unfortunate tendency of commercialism that from time to time springs up in any profession.

To achieve this on the part of the dental teacher makes him a success. To ignore this, even in the face of the most scientific instruction, must render him a failure. One of the highest functions and privileges of life is to impart knowledge to those who shall make of it a greater asset to their fellow men, but no knowledge imparted to young men is ever complete which does not

permanently weave into their very being those principles of moral and professional responsibility which form the basis of our best civilization.

But this also should always be remembered: it is one thing to advocate the right kind of living: it is another thing to live it, and living it is infinitely preferable to advocating it. If a dental teacher cannot subscribe to these ideals, he had better seek some other calling. If he does subscribe to them, he will find his richest reward in the consciousness that he is contributing in no small way to the betterment of mankind.

In summing up the traditions and responsibilities of dentistry of all nations, it may be said, in all modesty, that the profession has a tradition equal to that of any other calling of its age. From Fauchard, Godon, Tomes, Hunter, Paterson, Harris, Hayden, Miller and Black, on down to those brilliant men who are rendering outstanding service for their profession today, we have a line of eminent devotees who would grace the ranks of any profession. To these men we pay respectful homage at this time, conscious of the fact that, in so doing, we are merely bringing to their memory a tithe of the tribute which is justly theirs. And in assuming the task of carrying on our calling in a manner fitting to the splendid example of those who have gone before, we are charged with the responsibility which becomes sacred in the light of what has been done for us. It is our duty not only to honor the traditions and maintain the standards of the past, but also to consecrate ourselves to a new and loftier mission, the ultimate goal of which must carry us beyond the alleviation and cure of dental disease and take us into the rarer realm of humanity's greatest, and most profound, achievement—the blessing of prevention. Yes, then, and not until this is an accomplished fact, can we claim that we, as a profession, are entitled to the full confidence and commendation of the world. But when this is finally achieved, we may rest content in the conviction that we have contributed in full measure to the general good of the human race, and have won the laurel wreath which comes only as the reward of sacrifice and self-denial. To this prospect, I invite you tonight, firm in the faith and conviction that no matter how hard and difficult the road may be, the end will bring a sense of satisfaction and contentment that can only come to those who have labored unselfishly and successfully for their fellow men.

Dr. Thomas J. Barrett: I recognize the fact that I have no place on this official program, but to me has been assigned a duty that I regard as a privilege and that I feel sure this great assembly will accept as a pleasure.

Dr. Logan, I have been requested by your associate officers and the Committee on Organization to take advantage of this remarkable occasion and in the presence of this vast audience to say just one word to you and to present to you this emblem of leadership and authority, a gavel. In presenting that to you, Dr. Logan, I cannot add anything to the introduction that was so splendidly made by Dr. Friesell. He has outlined your achievements, public, civic and professional, but I do desire to say to you that not only have you achieved in that direction remarkable standing as a leader. In the direction of this congress, in the vast amount of detail, in the great work and the great sacrifice

of time that you have given to this, not alone have you won fame and distinction as the leader of American dentists, but you have won also the affection, love and full appreciation of all who have been associated with you for all the sacrifices that you have made.

I know this audience will join with me in wishing for you continued health, prosperity and success in whatever direction your future life may lead you.

The President: Dr. Barrett, as the representative of the Committee on Organization, I wonder what I should say. I know what I should like to say. I can say to this audience that, during the three years, there has never been a vote of the Committee on Organization or the Executive Committee of the Committee on Organization that the record will not show was unanimous. By that do not misconstrue me as saying that the committee always agreed with me; they did not, but the records show that the disagreement, after explanation, always disappeared, and the records show that the vote was unanimous for all the three years, and in the Executive Committee of the Committee on Organization on every vote every man voted. For that, I am thankful.

So this I will lay away as a forget-me-not for you all, especially the Committe on Organization and in particular the Executive Committee of the Committee on Organization. When I was wrong, you argued me out of it; when you were wrong, we went ahead. I thank you.

We have now reached that place in our program designated as the roll call of nations and states. It is indeed appropriate that the roll call should be instituted by one who has been associated in the active work of building up this congress for the past three years, and if our members are pleased with the results obtained by those in authority, meaning the Committee on Organization and all other committees cooperating with them, they should reserve at least one large portion of their commendation and praise for our efficient Secretary General of the Congress, Dr. Otto U. King.

Dr. King has been given the opportunity to serve the American Dental Association as its Secretary for fourteen years. It was he who founded it almost alone; and who has brought to its present state of perfection THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION; and he has maintained the membership of the American Dental Society at well over 30,000 for a number of years.

Ladies and Gentlemen, the Secretary General, Otto U. King of Chicago, will now proceed with the roll call of nations.

The roll call was responded to by the following nations:

Argentine
Australia
Austria
Belgium
Brazil
Canada
Chile
Colombia
Costa Rica
Cuba
Czechoslovakia
Denmark
France
Germany
Great Britain
Greece
Haiti
India
Irish Free State
Italy
Japan
Jugoslavia
Mexico
Netherlands (Holland)
Norway
Panama
Paraguay
Peru
Spain
Sweden
Switzerland
Uruguay
Syria
Venezuela

The Secretary General: That completes the roll call of nations. There are thirty-four nations represented with official delegates and six other countries that have representation here but are not in this roll call.

The roll call of states followed, the Secretary General beginning the roll.

The President: At this point in the roll call of states, the roll will be continued by one of our vice-presidents, who has made a large contribution to the subject of prosthetic dentistry. He is an active member of the noted Clinic Club of Detroit, a member of the state dental examining board of Michigan, former president of their state dental society, former president of the American Dental Association, and a gentleman of sterling integrity. Ladies and Gentlemen, Dr. William A. Giffen, of Detroit.

PRESIDENT'S ADDRESS, SECTION I*

By THOMAS P. HINMAN, D.D.S., F.A.C.D., Atlanta, Georgia

TO the essayists, members and guests of the Seventh International Dental Congress, Section One, your officers extend a most cordial greeting. It is very gratifying to them that you have shown by your contributions such a remarkable interest in the subjects covered by this section. In all lines of human endeavor, where the premises are sound, success is assured, and, as this section covers so many of the fundamentals on which must be built the future success of the practice of dentistry, it is gratifying to see the intense interest manifested in this portion of our work.

It is especially a source of satisfaction to note the contributions from our confréres from distant countries. We wish, at this time, to extend to them our sincere appreciation.

The number of papers on anatomy is most unusual and noteworthy. In the department of therapeutics, probably the most brilliant array of talent in the best of our profession will present a series of papers and clinics on root canal therapy. This, we believe, is the outstanding feature of this section. The present status of the therapy of the infected root canal and subapical area will be covered in a most thorough and detailed manner, and it is hoped that the moot question, i. e., the rendering of infected teeth safe from reinfection will show such progress as to stimulate the profession to greater activity along these lines.

The scientific data submitted from this section, in all its departments, mark a real advance in our professional status.

To our colleagues from distant countries, we extend again a most hearty greeting and trust that our intercourse with them will result in a more firm cementing of our professional and social relations.

*Section on Anatomy, Physiology, Materia Medica and Therapeutics.

THE FIELD OF RESEARCH IN DENTISTRY*

By ARTHUR D. BLACK, A.M., M.D., D.D.S., Sc.D., Chicago, Illinois

To the Members of Section II, Greeting:

TO our confréres from other lands, a most cordial welcome is extended. By this great meeting, dentistry again calls attention to the fact that its service is not limited by national boundaries, but extends and cooperates throughout the world. The officers of this section feel that we are exceptionally favored in having on our program so many who have earned world-wide distinction in this special field of scientific endeavor.

The deliberations of this section are likely to be of great import in the betterment of dental service, because we are linking more closely than ever the work of the research laboratory with operations at the chair.

If we should review the history of dental progress during the past one hundred years, we would note the lack of relation between the development of our knowledge of pathology and the mechanical procedures in operative or prosthetic dentistry, which are associated with the pathologic process either as cause or in treatment. It has been the work of a century to change the mechanical tooth tinker into a scientist who is concerned about his work in its health relationships. The itinerant dentist has become a dental physician and has risen from the rank of peddler to a place of respect and distinction because of the generally recognized value of his services.

This change has been gradually achieved through the work of men such as those whose names appear on the program of this section. As each patient worker has contributed his mite, one truth, then another, and another, has been wrested from the mysterious unknown, and gradually these truths have become common knowledge within the profession as a basis for improved service.

Dentistry has been gradually lifted, oftentimes rather unwillingly, by the very force of the accomplishments of our research workers, to a place where the value of its service is quite generally acclaimed. The time has arrived when it would seem to be worth while to review our record of progress and mark the men who have made the most important contributions. If the question were asked today: What has dentistry done for the advancement of the world in knowledge, health and happiness, we would be at a loss to reply except in the most general terms, for no comprehensive review has ever been made. Possibly nothing could be of more importance at this time, and certainly nothing could give greater inspiration to dental research workers throughout the world, than to have before us, and before the scientific thinkers of the

*President's Address, Section II (Bacteriology, Pathology and Diagnosis).

world generally, a well written record of the contributions of dental research workers.

As a contribution to this meeting, I have placed upon this table five volumes of the Index to Dental Periodical Literature in the English Language, covering the period from 1839 to 1890 and 1910 to 1920, inclusive, and I wish to report that the remaining years to date will be covered before the next meeting of this international body. These indices open the door which gives opportunity for a thoroughgoing study of the accomplishments of all our English speaking confréres throughout the years. Splendid progress is being made along similar lines with our literature as published in other languages.

It will, therefore, soon be possible for us to review the writings of all who have preceded and use their work as our foundation for the future.

These indices are mentioned here only for the purpose of suggesting their significance to our future progress. It is of no special importance that a few men, in the several countries here represented, have seen the need which dentistry has for the information sealed in its archives. It is, however, of great import that the profession has supported such work by both its money and its interest, because such support is indicative of the real progress that dentistry is making.

Dentistry will continue to improve its service as more men with noble ideals realize that their ambition to contribute to world betterment may be satisfied in this field. In the last analysis, our progress is marked by that reflection of our efforts and accomplishments in the public mind which induces more and more men of high qualities and attainments to seek dentistry as a means of satisfying their desire for service.

The impression that dentistry is making, particularly in its health relationships, should also be reflected in financial support of research in this field. Vast sums, amounting to more than $100,000,000, have been given for medical education and research during the past twenty-five years. These contributions have come because people of means have believed that they were public benefactions. Such gifts are the reflection of medical service. Similar gifts will be available for dentistry as our research workers are able to demonstrate that their work will be helpful to humanity.

The dental college of the future must be a center of learning which will be concerned not only with teaching of undergraduates, but also with the promotion of all phases of dental advancement. A faculty should not be satisfied to teach as best it may those things that are known; it should aspire to be constantly contributing to the progress and uplift of the profession, by the maintenance of research and the promotion of graduate and postgraduate work.

Again let me say that the men who have worked with the test tube and the microscope have been the largest contributors to dental progress. We welcome a host of such men from the four corners of the earth today. May this meeting inspire you to greater efforts. May the research workers of the future find your contributions to be real stepping stones for advancement, and may the joy and satisfaction of this work be yours to the end of your days.

OPERATIVE DENTISTRY*

By C. N. JOHNSON, Chicago, Illinois

IT is somewhat refreshing to contemplate the fact that, in this great Congress, the subject of operative dentistry is considered of sufficient importance to attract to the program of this section a list of speakers consisting of about sixty of the thinking men of the profession of all nations. In recent years, this most essential department of dental practice has suffered something of an eclipse in the professional mind, a fact which is apparent when we study the periodical dental literature of the day. It will be found that the percentage of papers on operative dentistry has been relatively small compared with those on other subjects, and it is an encouraging reflection to feel that, on this occasion, so many distinguished men are to be represented on our program.

There are two chief reasons for the apparent lack of interest in the subject of operative dentistry during recent times. One is the fact that the attention of the profession has been largely concentrated on other subjects which have been brought to the front by the wave of interest in focal infection and all of its allied consequences. The highest function of operative dentistry is to save the natural teeth; while the result of so pronounced a concentration on the dangers of focal infection has tended straightway to the elimination of the natural teeth. At this time, it is not appropriate that we enter on a discussion of the merits or demerits of the focal infection theory as it applies to dental practice; but the net result of the agitation over this subject has been that very many teeth have been extracted and much replacement work has been called for. This has created a natural concentration on such subjects as denture work, either full or partial, and on the various forms of bridgework. There has been a pronounced awakening as to the best methods of restoring missing teeth, and many ingenious ideas have been advanced and worked out. All of this has led to renewed interest in the problems of restoration, and much has been written on it. Naturally, when any topic is uppermost in the minds of the profession, that topic is given expression in our literature, and thus we find in recent years a predominance of articles on such subjects as focal infection, full denture work and partial dentures.

This has forced out of the professional mind, temporarily at least, such questions as the best means of saving the natural teeth, and to save the natural teeth is the destined function of operative dentistry. It might seem appropriate, particularly in this section of the Congress, to raise the question as to which is the highest expression of the dental art—to construct beautiful specimens of artificial restorative work, or to preserve the natural organs in a state of health and service? There can be only one answer to this question, because no matter how perfectly our restorations are made and no matter how much ingenuity and skill may be expended on this work, there has never yet been anything devised by man that will in all respects answer the same

*President's Address, Section IV (Operative Dentistry).

purpose as the organs provided by Nature. Always and forever, there is something lacking in every denture or bridge. The patient may affirm that these restorations are as satisfactory as were the natural teeth, and it is true that in many of them the ingenuity manifested must compel our admiration and command our respect, but, in the nature of things, every artificial piece has certain limitations which are inherent, and which can never quite be overcome.

It would therefore seem to be the part of wisdom for the profession to pay greater heed to the best means of preserving the natural teeth, and it is a matter for congratulation that this section makes such a favorable showing in men and papers. I trust that we may here at this time do much to reinstate the subject of operative dentistry in its fitting place as one of the limelight topics of the profession; and that it will ever after continue to hold the interest of the thinking men and women of dentistry. In some of its aspects, it contains the germ of the real hope of the profession in the highest service to humanity, and the attention of the profession must never be diverted from it.

And yet there is one aspect of the situation which may in part account for the fact that so little, relatively, has been written on operative dentistry in recent years, and so much has been written on other topics. The most active period in the literature of any subject is that which marks its evolution. When men are rapidly forming new ideas, and testing out one theory after another, they are most inclined to write on the subject. Their minds are absorbed with the various ideas which are constantly coming to the front, and it is only natural for them to give expression to that which is most actively claiming their attention. After the principles of any subject are well laid down, and the technic is thoroughly systematized, there is less tendency and less necessity for men to write on it, and thus we see another reason why artificial restorations have been so much to the fore in our literature, and filling teeth so much, apparently, in the background. Whatever may be said of the importance of the two subjects, at least this much must be claimed for operative dentistry, that its principles have been better formulated, and its methods more generally standardized than have those of prosthetic dentistry.

There are, of course, variant theories regarding the best kinds of filling materials, and each practitioner has his ideas as to which should be used; but when it is decided that a cavity in a tooth must be filled, the majority of operators at least know how it should be done. In other words, the principles of cavity preparation and the manipulation of filling materials have been so well formulated that the members of the profession are reasonably familiar with them. This cannot be said of prosthetic dentistry. Today, with all the splendid work that has been done on this subject, and with the army of men who are devoting their best energies to it, the fact must be apparent to everyone who reads our literature that there is still great confusion regarding it. In every department of prosthesis, there is a grave discrepancy in the opinions of our leading men, whether it be in crown and bridgework, in partial denture construction, or in full dentures. This will not always be so. The bright minds who are concentrating on this subject will one day formulate a more standardized system of restoring lost

teeth, and we shall see a greater agreement among them. Till this time comes, our literature will be filled with opinions and theories bearing on this subject, because it is the fortunate nature of our profession not to rest content until a problem is solved.

And this brings us directly to a problem in operative dentistry which is rapidly coming to the front, and which holds in it the germ of real progress and achievement in our chosen calling. In medicine and dentistry, the keynote of the hour is the question of prevention. More and more, we must concentrate on this problem, and while the halcyon days of widespread prevention of dental disease may seem a very long way in the future, we must never cease our efforts till this great dream is an accomplished fact. And how shall it come? No one at present can with assurance predict the precise manner by which prevention may be brought about, but it is safe to say that, today, operative dentistry holds the most promising key to the situation. The problem is not a simple one—there is no way by which we may wave the hand and say, presto! change, and, lo and behold! prevention is a fact. Up to this time, we cannot vaccinate against dental caries or pyorrhea, as we can against smallpox; nor can we resort to a serum as we can in diphtheria. Truly, we are behind the medical profession in this matter of prevention. The only thing that we can claim is this, that, after the disease gets a start, we can more successfully treat it than can the physician treat many of the diseases that confront him. That, at least, is something. While we may not be able to prevent decay of the teeth, we do know how to fill teeth so as to stop the decay in any particular cavity. But we must all acknowledge that to keep repairing the ravages of disease constantly, while it is an achievement of no mean proportion, is to fall far short of the highest expression of our possibilities as ministers to the welfare of the human race; and we shall never be able to ascend the heights of our destined mission till we have concentrated on the problem of prevention and brought it to a successful issue.

As has just been said we are not able today to predict just how prevention is to be achieved. Hope has been expressed that a study of diet might solve the problem, and much attention has been given this subject, but, up to the present time, the tangible results from this interesting study have been very meager. There can be no question that the factor of diet is a most important one, and that in the future it will be worked out to the great benefit of the people, but it has many angles which make it so intricate and involved that the road to its universal applicability is a long and well-nigh discouraging one. So far, the nearest approach to prevention has been through the medium of operative dentistry, and those who have seen the vision of what may be accomplished along these lines by a practitioner who has served the people of one locality for a great number of years and has thus seen generations come and go must needs be encouraged by the tangible results shown. He who has thus practiced operative dentistry, and who has been observant, has seen succeeding generations with teeth in infinitely better condition and with fewer cavities than the generations before, individuals brought to adult life with a full complement of natural teeth in good serviceable and functional status whose parents and grandparents had at their

age, through lack of dental attention, lost many of their teeth, and been brought to the penalty of wearing artificial substitutes; demonstrating that the later generations are reaping the benefits of what operative dentistry has to offer.

All are familiar with the methods by which this improvement is brought about, but it will do no harm to refer briefly to the plan of procedure. It relates solely to early and frequent attention to the teeth of children so that small defects are detected early, and promptly cared for before the decay has become serious enough to weaken the teeth, and to such constant periodical supervision of the mouth that the full functional activity of comfortable mastication is insured, and decay is kept down to the minimum. If this kind of campaign is maintained through childhood and youth, it will ordinarily bring about a condition of immunity early in life, and the problem of saving the natural teeth is practically solved. Every observant practitioner has had the satisfaction of noting this happen so frequently in his experience that it constitutes itself a rule rather than an exception, and, in the ultimate, it proves one of the chief sources of satisfaction after many years of professional endeavor. It is therefore fitting that we invite every practicing dentist to a prospect such as this, which, with our present light, brings to us the greatest assurance of success of all the plans thus far advocated for the prevention of dental disease. All plans must of necessity be slow, but at least this plan has been proved feasible, and this is more than can be said of any other so far suggested. It is, therefore, at least well worth trying.

In conclusion, I wish to express my keen appreciation of the services rendered the section by our worthy secretaries, particularly by Dr. Fickes, who from the beginning has labored most faithfully and efficiently in arranging the program. Without his aid, the work would not have progressed so satisfactorily, and the officers are under deep obligation to him. Permit me also, at this time, to bid a most cordial welcome to the members of this section, and in particular our colleagues from other lands. Their presence with us under a difficult exchange situation is a distinct compliment to America, as well as an obligation on us as hosts. The cooperation of all concerned is most earnestly solicited in making our section work a success, with the confident hope that, at the conclusion of our program, every one who attends the sessions may feel that the time thus spent has been pleasantly and profitably employed.

PRESIDENT'S ADDRESS, SECTION V*

By HART J. GOSLEE, B.S., D.D.S., F.A.C.D., Chicago, Illinois

To the Members and Guests of Section V, Ladies and Gentlemen:

SECTION V extends to all guests, members and visitors most cordial greetings, and bids you welcome with a depth of sincerity and warmth of hospitality which we believe could not be exceeded by any of our older and traditionally more cultured nations.

Your presence here today, together with the ever helpful encouragement

*Section on Partial Denture Prosthesis.

and assistance you have so cheerfully contributed to the organization, promotion and auspicious beginning of this, the Seventh International Dental Congress, indicates your devotion to the cause of dentistry, and proves your unselfish interest in the progress and advancement which dentistry has made and is making throughout the world.

The officers of Section V are conscious and appreciative of their responsibilities on this occasion. While we realize that this section constitutes but a single link in a group of fifteen in this great Congress, we nevertheless feel that no other one section is more important, and that partial denture prosthesis, including crown and bridgework, embraces the highest and most versatile field of effort in the art of dentistry.

The development of dentistry into a great separate and distinct profession has been nothing short of marvelous, and the development of dental art has been equally rapid and wonderful.

Prior to the Fifth International Dental Congress we were told that American dental art was recognized the world over as being of the highest type. We were proud of this recognition, and it stimulated and inspired us to higher achievements.

During the period intervening between the fifth and sixth international congresses, the dental world was electrified by the introduction of the casting process, from which modern dental art undoubtedly received its chief and most momentous impetus.

Former methods of filling cavities in teeth, and of building crowns and bridgework, were completely revolutionized, and the even then high standard of dental art was placed on a still higher plane.

But progress did not stop with these brilliant achievements. Between the sixth congress and the congress now just convening, even greater progress, proportionately, has been made. The casting process has been further developed, until it now embraces the successful casting of full dentures, of partial dentures of any size, with or without clasps, all in one piece, and of all forms and types of crowns, and of removable and fixed bridgework. Indeed, there seem to be no limitations to its possibilities, or to the range of its successful application. For this progress, and for these achievements and those to follow, all of which were enthusiastically predicted at the time of the original presentation, the profession must ever give credit and remain indebted to the master inventor, William H. Taggart of Chicago.

Great progress has also been made in the respective fields of fixed and removable bridgework; in dental porcelains and electric furnaces; in porcelain jacket crown work, the one ideal method of restoring the crowns of teeth as a single unit; in a broader knowledge and keener appreciation of the fundamental and essential requirements of articulation and occlusion; in dental articulators; in artificial teeth; in vulcanite rubbers, and in many other dental instruments, materials and products of all kinds.

And yet as we pause in retrospect, we are reminded—indeed, we cannot forget—that the pathway leading to the progress made in some of these lines was not strewn with roses at all times,

nor was it entirely free from thorns, in many ways.

False theories and impracticable fads and fancies have confronted us from time to time. Overly zealous theorems and overly effulgent recommendations clothed in the mantle of science; and unnecessarily vicious criticisms and condemnations of various lines of procedure, and of certain methods and systems, all backed usually and to a greater or less extent by selfish aims and ambitions, have at times momentarily halted our progress.

Among the first of these was the vicious indictment made against the use of any form or type of fixed bridgework. To the credit of the more rational thinking members of the profession, and owing to the biologic studies and findings of T. A. Hardgrove, of Fond du Lac, Wis., fixed bridgework passed through the crisis of the epidemic fearlessly; withstood successfully all of the abusive and falsely scientific attacks made on its use, and is now a healthy and vigorous convalescent.

As a result, the entire world now recognizes that fixed bridgework is a safe, sane and useful means of replacing missing teeth, when indicated, and its usefulness will probably never again be questioned.

The next great epidemic of radicalism to darken the horizon of progress, and to threaten even the further need for partial denture prosthesis of any form or type was evidenced in the position taken by some of our prominent pathologists, both medical and dental, in relation to the problem of the pulpless tooth.

The despotic and devastating wave of condemnation of all pulpless teeth which followed was succeeded by a tidal wave of even greater potentiality, condemning all teeth that carried gold or porcelain crowns or even large fillings, or which showed the slightest evidence of an incipient pathologic process in the form of gingival disturbance of any kind; and, without regard for age, or postoperative results, millions of good, useful teeth were lost by extraction.

While it lasted this wave fostered—and pseudo-scientifically excused—a practice which was nothing short of criminal. Fortunately for humanity and posterity, this wave has now just about spent its fury and will soon be forgotten by all excepting the victim of too much science, too much guesswork and too much laboratory research investigation, without clinical backing.

Additions to science, medical or dental, become established scientific truths only when backed by clinical experience extending over a period of time sufficient to afford positive proof. Hence, is it not possible that the findings and claims of Rosenow, Torens, Price and others may be questioned? At best, their claims are based upon their own interpretations of their own personally conducted investigations, and are not yet backed by clinical evidence or proof. Therefore shall we accept their findings as positive scientific truths prematurely, or shall we be conservative and wait until time and clinical observations shall have proved them established scientific facts?

For the reason that, irrespective of however much scientific training we may have back of us, or however much talent or skill we may possess or acquire, no one may ever hope to replace

missing teeth—from a single unit replacement to a full denture restoration—in a manner that will completely and efficiently fulfil the physiologic requirements superimposed upon the normal dentition, it is my belief that it is our duty to wait until such claims become permanently established as scientific truths.

Nature usually provides biologic, anatomic and physiologic perfection. Art never does, but is at best only an imitation, and most times a poor one, particularly as applied to the restoration of normal, functional activities.

It is my firm belief that every natural tooth that is not hopelessly pathologic, beyond question or doubt, is a physiologic asset; and also that any natural tooth that is doing no harm possesses a value far beyond that of any type of artificial replacement. Hence, any practitioner of either medicine or dentistry who advises or recommends the indiscriminate extraction of the natural teeth without first weighing the question seriously, and studying the postoperative results carefully, is either a pathologic crank or a physiologic nihilist.

A decade ago, it was the ambition and the recognized duty of a large percentage of the dentists of the world to make an honest and conscientious effort to save the teeth of the human family. Why should such an ambition and such a practice—the very foundation of dentistry—have become changed, almost overnight, by the suddenly discovered and broadly heralded findings of a few perhaps overly zealous pathologists?

Had this wave of radicalism continued long, dental art would have become a lost art. Only specialists in exodontia and full denture prosthesis would be needed in the days to come, and the peoples of the world would soon have become prematurely senile.

But, fortunately, the lifetime of radical thoughts and theories is usually of short duration, and, in the end, they often bring about a reaction that is helpful, whatever the cost may be.

Sympathy should be extended to those who eagerly accepted and championed these radical theories—and there were many who did so—because it was undoubtedly but a case of the blind leading the blind. In such instances, the journey, while it may be filled with thrills, is not usually a long one.

It is traditional that no progress is real progress unless it bears the earmarks of rationalism. Rationalism! Yes, my friends, that one majestic, magnetic word. That one word which stands as a beacon light to illuminate the pathway of progress—of a progress which continues to lead to higher and higher achievements, and ultimately to a safety zone where it will endure.

In building the program of Section V for this momentous occasion, your officers have endeavored to have it include and embrace every outstanding, rational method of procedure that has withstood the acid test of time, and to have every paper, every discussion and every clinic representative of the thoughts and work of the most progressive writers and teachers of the day, and of the world.

To build such a program and thus to fulfil our ambitions has perhaps been no easy task, but it has been a pleasant one, and we feel repaid for the effort by indulging in the hope that the program to follow will be a credit to the Seventh International Dental Congress, and an inspiration to the dental profes-

sion of the world for some time to come.

Again I bid you welcome.

Procede sed semper sano animo.

DISCUSSION

Rea Proctor McGee, Los Angeles, Calif.: Dr. Goslee's appreciation of the great work of William H. Taggart in his invention of the casting process should be shared by all of us. It is indeed a pleasure to hear a man of Dr. Goslee's eminence give the credit that is due to Dr. Taggart, in these days when it is so common a procedure to adopt the products of a clever man's brain without giving due credit. Not only has the invention of Dr. Taggart modified the processes in the construction of fixed bridgework; even those who work in porcelain are largely guided by the principles laid down in the construction of gold inlays and partial crowns. The advance of partial dentures and bridgework has also been greatly aided by the cooperation of the manufacturer. It is quite true that the path of progress in all departments of effort is strewn with difficulties. Many theorems, alleged scientific principles and vicious criticism, as well as certain selfish aims, undoubtedly contributed to the indictment of fixed bridgework. Another great contribution to the disfavor into which fixed bridgework fell was the atrocious carelessness in the production of fixed bridgework, which was not uncommon throughout the country. Expert operators were not and are not sufficiently numerous to make all the bridges that are worn, and it is an easy matter to produce evidence against fixed bridges by examining the product at any extracting clinic in the country. The inclusion of all fixed bridgework in condemnation was manifestly unfair. All of our advances have been marked by progressiveism vs. fundamentalism, all wars, political agitation, religous reforms are marked by battles between the radical and the conservative, the progressives and the fundamentalists. The pendulum finally comes to rest in this as in other controversies and the place of fixed bridgework is definitely recognized, but it is a far better fixed bridgework than we knew before the fight. The average operator is now much more careful and technical in his construction as well as in his selection of the cases in which this particular method should be used. The argument regarding the pulpless tooth will probably be with us until the end of time. As far as the wave of wholesale extraction is concerned, it is quite true that millions of teeth were removed; quite likely many of those millions should have been left alone, but just as war's greatest fault is that it kills the wrong people, so extraction sometimes gets the wrong teeth, but we can truthfully say that there are yet millions of teeth that should be sacrificed and whose removal and replacement by partial dentures and bridges would be of the greatest benefit to the patient. Mere opinions are not science. Dr. Goslee has well stated the formula for the establishment of a new observation as a scientific fact, but even when the scientific accuracy of an idea is established, it takes judgment to use it. No one may expect to replace lost teeth so perfectly as to restore completely both the appearance and the function of normal teeth. Most of the teeth to be replaced have long since lost a considerable portion of their function, and, like some of our political friends, are dead but don't know it. There are cases in which the replacements are far better than the lame teeth that they succeeded. The hopelessly pathologic teeth must be removed. The retention of the natural teeth doing no harm, but also doing no good, I question. Our laws recognize the same condition in society, and, instead of waiting for death, provide divorce, with replacement that is frequently a great improvement. So far as the wave of radicalism is concerned, there will always be waves of radicalism; a radical is a person who is energetic, but dissatisfied; a conservative is a radical who has gotten what he wants. In the editorial capacity, I am rather frequently embarrassed by the childlike belief of the general public, you included, in the printed word. If a statement containing a new idea is made orally to a person of average intelligence, he will immediately want to know how you reached your conclusion, and who is the authority; but if he reads it with no name and no authority attached, he believes it. We have the same childlike confidence in our pathologists, bacteriologists and roentgenologists. You must remember that your patient is human, and that the pathologist as well as the others is also

human. There is no criterion by which, in border line cases, a pathologist may not make a mistake; in fact a pathologist's report is his opinion of the case as he sees it in the microscope, and opinions are not always 100 per cent accurate. The bacteriologist is more accurate than the pathologist because his tests have been developed to the point where it is not very difficult to check him up. When it comes to the roentgen ray, anything can be simulated by a clever manipulator, and since it is comparatively easy to manipulate the roentgen ray, it is just as easy for the inexperienced to make the grossest mistakes with the best intentions, and the patient occupies the position of the famous "ultimate consumer." Consequently, you cannot rely on any roentgen ray film unless you know positively that the proper angles were used and the proper exposure of the plate and subsequent development was made. You will then find that the film, if perfect, is one-third of the diagnosis and that the other two-thirds must be supplied by experience, intelligence and good judgment. This does not mean that the retention of septic teeth should be countenanced. We have reached an advanced stage in this work because, in this day of mechanical perfection, we can turn from the empiric methods that must accompany the age of primary development, and we can now study the technical application of restorative appliances in their true relationship to the needs of the patient, so that, with the application of skill, knowledge and honesty of purpose, the work of this section could very properly be termed "prosthetic therapeutics."

PRESIDENT'S ADDRESS, SECTION VI*

By CHARLES LANE, D.D.S., Detroit, Michigan

THERE are many reasons why this Congress should be the most beneficial meeting that the dental profession of the world has ever had. It makes possible the association of all men interested in full denture work, which we will concede to be the most beneficial experience that we might contemplate. There is no doubt that associating and fraternizing will result in greater development, from both a research and a manufacturing point of view, than any other effort or combination of efforts. If we should review the past years, we might reasonably concede this to be true.

It is evident that men working alone or comparatively so, make progress slowly, and probably find that others have preceded them in accomplishment. Had these men associated with their fellow practitioners, much effort could have been expended in cooperation or in other directions, with much greater progress as a result.

Many of us in the dental world feel that marvelous progress has been made in research and manufacturing, as applied particularly to full denture construction.

We do expect that many wonderful, and possibly startling, developments will occur at this meeting, because of the association of the best minds in the profession from all over the world.

We who are intensely interested in this branch of dentistry are constantly living and working in a mood of expectancy, and unquestionably the apparent impossibility will develop into a reality.

There is no question that the indi-

*Full Denture Prosthesis.

vidual's progress and development have been startling, more because of the application of the other man's ideas, teachings and influence, than because of scientific development from his own research and manufacture.

Unquestionably, this intensive study will result in amazing development, but at present we should conclude that we are but pioneering.

It is becoming more evident as time goes on that, in order to progress, we must fraternize, and be forced by association to absorb.

All of the men of this country are delighted to express to the men from other countries their great pleasure at this time, and it is a pleasant duty that as President of Section VI, I have to perform today, in assuming the responsibility of telling you how much we wish you, from all over the world, to feel entirely at home with us, and we hope that our hospitable feelings and actions will be so apparent to you that it will just be routine. We hope that you will be repaid for your sacrifices, of which we are aware, in coming to this congress.

When constructing the program, your committee was wholly conscious of the fact that many of the good things available pertaining to this subject could not be included, and we believe that we could have a program so extensive on full denture detail that the mass of material would surprise the most optimistic.

The subject of full denture today must include many lines of study as compared with the apparent necessities of a few years ago. Some of our men have spent years in developing and redeveloping, in constructing and reconstructing, and still seem far from a product which they wish to call finished or perfect. Apparently, this condition is to continue with a reward of degrees of success sufficient to keep them forever working and striving for the health and happiness of mankind. We all owe these men much, so much that we cannot pay but we can recognize, we can encourage and we can help. It is every man's duty for the health of the world and for the standing of dentistry in the realm of professions to do everlastingly all that he can and even try to exceed this.

We develop in waves, in cycles and almost it seems in spasms. Not so long ago, nearly all prosthetists thought that, in order to be a success, he must produce an approximately perfect impression of a maxilla or mandible and his troubles were over. Then, for a while, nearly everyone thought that if he purchased an articulator of the best type, his troubles would be few. These impulses and others of like type have impressed us all so forcibly that now essayists seldom report a panacea for all our troubles. References are more often made to the fact that the only royal road is one of a laborious type, with undivided attention to detail. Our failures in practice are of sufficient numbers to make us constantly aware of our lack of knowledge in mastering and controlling the human mechanism.

Our progress is due to our mistakes and so we have no real reason for feeling disheartened, but can remember that "necessity is the mother of invention" and that we are on our way to newer and better things.

PRESIDENT'S ADDRESS, SECTION VII*

By R. BOYD BOGLE, D.D.S., Nashville, Tennessee

Members of the Seventh International Dental Congress:

AS a representative of the officers of the Seventh Section, it is my delightful duty to extend to you a cordial and sincere welcome.

This meeting will undoubtedly record the greatest gathering in the history of dentistry. This is the third time in the history of our profession that we have had an International Dental Congress in the United States—in 1893, 1904 and 1926.

We are proud of American dentistry and her accomplishments. We are not unmindful of the achievements of the pioneers of other countries who have made valuable contributions to our profession.

The interest manifested in dental progress and accomplishments will be evidenced at this meeting. The attendance at this Congress bids fair to excell that of all previous congresses. In the Congress of 1904, twenty-seven countries were represented by delegates, and the membership reached a total of 1,600. This surpassed the attendance of any previous congress by 300. A comparison of attendance will impress you with the increasing interest manifested by the profession of America.

Well do I recall at the sessions of the Fourth International Congress the emphasis placed on the importance of more efficient dental service in connection with eleemosynary institutions; the appeal for better instruction of the public through the avenues of the public school system and the press in matters pertaining to mouth hygiene; presentation of advanced ideas on the questions of dental education and dental legislation, and the recognition and appointment of dental surgeons to the armies and navies of the world.

The magnificent program that is to be presented holds much for the members of this section.

I wish to give credit to the late president of this section, Dr. John F. Biddle, for the excellent work he did in its preparation. The program that you are to enjoy is almost entirely the results of his efforts.

Again I wish to bid you welcome. I hope that the sessions will be both profitable and pleasant, and that you may carry home with you pleasant memories of the greatest meeting in dental history.

*Exodontia, Anesthesia and Roentgenology.

THE ORTHODONTIC TREND*

By B. E. LISCHER, D.M.D., F.A.C.D., St. Louis, Missouri

WITHIN the restricted confines of dental practice and in response to human need, orthodontics has progressed from simple, empiric methods to a creditable professional pursuit, contributing to man's health and happiness.

The predominant persuasion of our time commands that we change our opinions and judgments frequently, because countless proposals clamor daily for our support. Notwithstanding this constant liberation from old beliefs and modes of practice, many have an abiding faith in the ultimate triumph of a perfect order. Doubtless a mere enumeration of the achievements of man, in almost any department of human endeavor, would tend to affirm this faith. But is it reasonable to accept this conviction implicitly?

"Most generations, it might be said, walk in a path which they neither make, nor discover, but accept; the main thing is that they should march." (Tawney.) And in the long progression of the centuries, countless ideals have alternately prevailed or have been consigned to oblivion. In other words, final fulfilment seems not to be an intrinsic property of the scheme of life. Hence, an appraisal, or evaluation, of the orthodontic trend may serve as an appropriate theme for this address.

I am not unmindful of the difficulties of such a task, nor of my deficient qualifications; but I hope to at least partially discharge my indebtedness to my colleagues for the high honor conferred on me on this occasion.

The list of subjects which might appropriately be discussed is so long that selection becomes difficult and comprehensive treatment impossible; hence, consideration of a few appears the more useful.

I.

In medical science, constant inquiry is made into the origin of diseases, so that their treatment may become more effective and their occurrence ultimately reduced. In our specialty, numerous factors have been studied as probable causes of dental anomalies, which, for the sake of clarity, we divide into the extrinsic and intrinsic groups. In the extrinsic group, we include all environmental, or acquired, influences; in the intrinsic group, all factors that are inherent in the organism and frequently congenital, but not accidental, in origin.

Our greatest gains have been made in the extrinsic group. Thus, the premature loss of temporary and permanent teeth, the prolonged retention of temporary and supernumerary teeth, pernicious habits and accidents are firmly established as causes of abnormal development of the human denture. Other environmental factors, notably diet and disuse, artificial feeding during infancy, uterine pressure during gestation, and nasal stenosis, are frequently presented, but not without perceptible partisanship and inconclusive evidence.

The probable effect on dentition of

*President's Address, Section VIII (Orthodontia).

the infectious and nutritional diseases of childhood, of disturbances of the glandular secretions of the body (endocrine factors) and of racial intermixture is not definitely known.

Congenital cleft palate, anomalies of number and form, as well as some extreme anomalies of position (commonly referred to as transversion and perversion) may be regarded as intrinsic factors, but their causes are not understood.

Some writers have endeavored to attribute sundry forms of dental anomalies to heredity, but "Definite confirmation in man is, in the light of present-day investigations, involved with unusual difficulties, and cannot be achieved by observation of a single characteristic. There are so many similar, even equal, characteristics and peculiarities between individuals (even among those who are not related, among whom heredity can, therefore, play no part) that a final conclusion about the transmission of similarities between parents and children is impossible. Even if we agree that the cause of individual variability lies in the union of the germ cells, it is still in conformity with biologic truth to maintain that these differences are in large measure influenced by the conditions of life." (Simon.)

In other words, we do not reject heredity as a causative factor for the naive reason that "Nature never transmits the abnormal" (an ingenuous view of twenty years ago), but because our meager scientific data do not warrant its acceptance.

Carefully planned laboratory investigations and the compilation of accurate, unbiased, comprehensive clinical records, of standardized form, are necessary before substantial progress can be achieved in this field of inquiry.

II.

The obstacles encountered in the treatment of dentofacial deformities quickened the systematic consideration of their numerous variants; hence, diagnostic classifications have always been offered in generous measure. But an analytic, scientific inquiry into their morphologic characteristics was long delayed, probably for the following reasons: 1. The technical difficulties of treatment are so prodigious that every practitioner has to struggle with their exacting demands. Prior to the introduction of standardized appliances, the attainment of the necessary operative skill transcended all other subjects. 2. Though the term anthropology dates back to Aristotle, the development of anthropometric research is a very recent accomplishment of science.

Gradually, though none the less surely, we are coming to a realization of the fact that these malformations extend beyond the dental boundaries of the human denture. Their cephalometric relationships are as important and fundamental as their dento-occlusal aberrations.

The problem of classifying dental anomalies for diagnostic purposes could not be solved by the numerous methods heretofore employed, because of their neglect of the comprehensive morphologic principle of dependent relationships between the teeth and other parts of the head. The originators of some of the older methods were conscious of this deficiency, but they failed to analyze and interpret it.

Simon's gnathostatic methods of diagnosis embrace this principle, and present a logical, as well as practical,

solution of the problem. With the aid of these methods, every dental anomaly can be classified, and the practitioner may now acquire the difficult art of differential diagnosis.

With the help of former classifications and standardized methods of treatment, considerable success (not to mention prosperity) can be achieved; but every practitioner ultimately accumulates his quota of failures, regardless of the methods that he pursues. Some of these are end-results following years of painstaking and conscientious efforts; others are not failures *per se*, but their finale is not a desirable consummation. In still others, the age of the patient is blamed; noncompliance with treatment requirements is charged, or external conditions are impugned, such as his ability to pay, etc. Finally, "When we have exhausted every available method we can tell the patient that the deformity is 'inherited' and will never yield to treatment. But the decision thus confided to the patient is not based upon scientific facts." (Simon.)

In all probability, most of these frustrations are due to a faulty diagnosis. An exacting, intrinsic, differential diagnosis is frequently impossible when only an intra-oral method of diagnosis is employed. The many innovations in corrective measures, which continue to be offered, confirm this conclusion.

III.

The introduction of standardized appliances, predicted by Farrar in 1878, marks an epoch in orthodontic therapy. It resulted in a desirable simplification of the methods of treatment, released the practitioner from the drudgery of their manufacture and secured the necessary leisure for consideration of the principles of treatment.

But the marvelous achievements proclaimed by some of the originators of standardized appliances has retarded the very purpose and end of orthodontic art. Because sundry forms of malocclusion of the teeth yield to a standardized treatment, this apparent success has frequently encouraged the false hope that a kind of uniform appliance, if properly perfected, would become the messenger of the millenium.

And some of these so-called systems have been protected with patents (a form of governmental grant), securing to their originators the exclusive privilege of vending them to practitioners. It is not improbable, therefore, that the claims made for some of the standardized appliances were unduly affected by the hope of a monetary reward.

Dentofacial deformities are not merely composed of malocclusion of the teeth; the alveolar process surrounding the dental arches, the jaws beyond the alveoli and various parts of the external face may all be involved. Manifold complications thus present themselves, and the unbiased, observant operator of experience soon learns that no single type of appliance, of whatever pattern, can ever fulfil all indispensable treatment requirements.

A differential diagnosis, which necessarily precedes a wise prognosis, is the safest guide for selecting methods of treatment. A total mandibular retraction, or a total mandibular protraction (to mention but two kinds of deformity), may now be definitely diagnosed in early childhood. But if, perchance, complete malformation is permitted to ensue in either kind, correction can never be completely attained by the

mere use of delicate, intraoral, orthodontic mechanisms. The nonmechanical measures so skilfully developed by Rogers for use in the early stages, and surgical correction for cases in which treatment was unfortunately too long delayed, offer the only rational modes of procedure in such instances. The former may or may not be used in conjunction with orthodontic appliances; the latter must precede final dental-orthopedic service.

Our progress in differential diagnosis is notable, and we are acquiring definite information concerning orthodontic limitations. Several extreme anomalies may now be accurately defined and orthodontic failures decisively reduced. The syndromes of certain others require medical investigation and cannot be explained without the assistance of the internist and pediatrician.

Years ago, Tomes taught that dentition was not a continuous process—that courses of activity were followed by periods of rest and that it extended intermittently from the sixth week of life to the age of physical maturity. During this prolonged interval, there are opportune stages of growth and development (even in dentures that exhibit anomalous tendencies), which are favorable for orthodontic aid. Indeed, one of the most important contributions to orthodontic therapy may be our current practice of skilfully assisting dentition. The rigid, rather severe, modes of treatment of twenty years ago are giving way to the more varied, flexible and pliant technic recommended by Lourie, Mershon and Oliver.

Practically every orthodontist acquires an education in clinical dentistry prior to his entry into the profession and is, therefore, familiar with, and able to observe, the varying degrees of immunity and susceptibility to dental caries. It is generally recognized that the presence of orthodontic appliances in the mouth do not promote oral cleanliness, and instances occur in which susceptibility to caries seems to be increased when they are applied. Yet it is worth noting that, in the mouths of immune individuals, even where laxity in oral hygiene continues despite our best efforts at correction, immunity endures. Why this is true, we cannot say; but the careless criticism that is sometimes directed at orthodontic treatments is not always justified.

IV.

We may accept the publication of Fauchard's book (1728) as a definite date for marking the birthday of orthodontic literature; but our greatest growth has been achieved during the last twenty-five years. Much has been accomplished in this short period, and we are entirely justified in rejoicing over our attainments. Undoubtedly, orthodontic service is now worthy of general adoption, notwithstanding its acceptance by the public at large is wofully deficient. It is not yet recognized as a necessary part of oral health service; in present-day practice, it is being supplied in terms of a luxury.

Numerous factors contribute to this unsatisfactory state of our specialty. An uninformed observer may question the economic basis of this inadequacy, but the best obtainable statistics are indisputable. More than 50 per cent of the children of many communities present anomalous dentures. Approximately 35 per cent are afflicted with extreme oral malformation, which seriously impedes their normal development. Fully 80 per cent of our

families have an income below $2,000 per annum. It is obvious, therefore, that this newer form of dental service is inaccessible to a vast majority, "because of its relatively great expense and the very limited dental personnel available." (Davis.)

A great obligation is thus imposed on the profession. Any extension of orthodontic service without the best professional guidance would be disastrous; and an effective extension of this service can follow only if it is made an integral part of public dental health programs. Our ablest minds must devise a plan, or definite project which includes affiliation with general dental health movements. Our exclusive societies of specialists should seek these larger contacts as opportunities for cooperation, to insure a more liberal and worthy growth of the art in the future.

As these enlarged participations are secured, abundant opportunities for research will ensue. Local, state, national and international units of organization, or commissions, should be established. Thus, orthodontic principles and methods will not only gain a wider field of application, but also will themselves unfold the more soundly. A central office, or institute, should be founded for the collection and confirmation of all important data. Large groups of individuals, of various ages, with anatomically correct dentures will be available for study, as well as collections that exhibit common, abnormal characteristics. With the aid of cephalometric methods, valuable information may thus be secured for dental science. Research would be encouraged a hundred fold; scholarships, or fellowships, for talented and deserving students could be supported; our nomenclature would be improved and unified; investigations of causative factors might be validated; educational methods and problems could be clarified; our literature would be enriched, and research work of exceptional merit might then be favored with a more fortunate and authentic publication than has heretofore obtained.

Technically, dentistry may be said to have arrived at its full stature, educationally, it has been admitted within the portals of our universities and has perhaps reached the adolescent period of its growth; clinically, and scientifically, it needs to utilize its opportunities more fully.

The program of this section is replete with a large variety of valuable contributions from many of our ablest colleagues, and I voice the gratitude and appreciation of every officer of the Congress, and particularly of the section, when I thank you heartily for your willingness to serve. The labor you have thus expended and the sacrifices you have made can only be compensated if we firmly follow the highest ideals and emulate the honorable traditions of the great and noble art of healing. And to make the future of our beloved specialty more secure, that future which everyone of you cherishes and frequently contemplates, we must resolve, here and now, to renounce all that is base and unworthy, to discard all questionable methods, and to cling steadfastly to the good and the true.

V.

In conclusion, I submit the following opinions to your consideration:

1. Our knowledge of the etiology of dentofacial deformities is very deficient, and much research of a high

order of scientific merit needs to be done. University laboratories and facilities should be accessible to qualified investigators in this field. The forms for case histories from private practices should be standardized by an international commission, in order that they may be brought within the exacting scientific requirements of such investigations.

2. Diagnostic procedures that are not based upon the comprehensive morphologic principle of dependent relationships between the teeth and head are obsolete. A prudent prognosis is based upon the inherent conditions revealed in the differential diagnosis. Many orthodontic failures are undoubtedly due to faulty diagnosis.

3. No particular type of appliance, patented or otherwise, can ever fulfil all indispensable treatment requirements. A rational eclecticism, which bids the practitioner to use discernment, based upon exact data obtained objectively, in selecting his methods from various systems and sources, is the safest rule in orthodontic therapy. Skilful assistance, usually applied intermittently during opportune periods of a child's dentition, is an accepted principle of present-day practice.

4. The intrinsic difficulties encountered in correcting oral deformities should convince every honorable dentist that the widespread custom of submitting plaster casts to mechanical laboratories for treatment plans and guidance, as well as appliance construction, is a species of quackery, an injustice to the patient and a violation of the fundamental principles of professional ethics.

5. Orthodontics has become a worthy professional pursuit and merits university recognition in its educational, technical and scientific aspects. This requires an extension of educational facilities, so that all who may wish to prepare themselves for its practice in the future will have an opportunity to pursue graduate study. Orthodontists and orthodontic societies should seek contact with the larger, wider fields of dental education and general oral health service, to guide more effectively the future evolution of the art.

DISCUSSION

C. A. Hawley, Washington, D. C.: The chairman has chosen an excellent subject. Its discussion combines history, a statement of facts regarding the present and prophecy of the future. We often hear it said, in opening the discussion of a paper, that the essayist has covered the subject so well that there is little more to say. In this case, however, I would say that the subject has been so well treated that everything in orthodontia is opened for discussion. Therefore, what I have to say will be an extension of Dr. Lischer's treatment from my own point of view and to emphasize certain phases that seem most important to me. The last twenty years has been marked by an intensive study of occlusion. In accepting occlusion as the basis of orthodontia, the science and practice was lifted from the chaotic condition of former years and given a basis and an object—an ideal. Every phase of occlusion, its development, the causes of malocclusion, both extrinsic and intrinsic, to follow the terms used by Dr. Lischer, have been exhaustively studied in their bearings on the minutest details. The influences of inheritance, of congenital factors, of endocrine disturbance and of the accidental factors that disturb the development of malocclusion have been treated exhaustively. The study of diet, of evil habits, the growth and development of the perfect denture has been the subject of extensive research. The character of tooth movement, of the effect of different appliances, of biology so far as it bears on the movement of teeth, of biologic or physiologic movement of teeth has all received extensive and exhaustive study, and it seems, at times, that we have discovered all that can be known of these subjects as they bear on the move-

ment of teeth in the development of normal occlusion. The study of what normal occlusion is for an individual, or the "individual normal," to quote Johnson, has been also the subject of extensive inquiry. All this research has been of the most tremendous value to the science of orthodontia and will stand for all time as a most tremendous contribution of these two decades. Yet have not all these studies in the end led us to the conclusion that, as far as the practical or remedial measures of orthodontia are concerned, when the period of treatment is reached, at, say, 6 or 7 years, if a state of malocclusion then exists, as far as causes are concerned, we are dealing with a stage in which they are exhausted, a condition *in status quo*, in which future development to an ideal condition must be along the lines of artificial stimulation and is clearly prescribed? And, as far as treatment is concerned, we are again limited, on the one hand, to the amount to which already stunted bones can be made to complete their development and, on the other, to the inherited size of the bones—a definitely limited amount. The predominant ideal for the last twenty years has been to produce a normal occlusion with all the teeth in place, whatever may have been the state of development of the surrounding tissues, bones of the face, etc. Yet complaints have been registered that, in many cases, such results cannot be permanently maintained, and if they could be, the results were not pleasing from an esthetic standpoint. The papers of Lundstrom on the apical base, cautioning against exceeding, in the development of the denture, the bony base that is the foundation of the denture, and the complaint of Lockett that many cases treated on the basis of perfect development of occlusion are a final failure are the expression of facts that have also been observed by many others. We have heard many warnings in the time past that there was such a thing as an overdevelopment of the dentures and consequent unsightly results in the face. Modern orthodontia has been charged in many quarters with producing dentures that were unsightly from an esthetic point of view. If these statements are facts and truly represent the existing conditions, is it not time to retrace the ground and inquire as to whether our hypotheses at the beginning were true? Orthodontia as represented by what is often called the "new school" has been practiced upon the basis of two hypotheses: 1. The maxillary first molars, and consequently the maxillary denture, is always in a fixed and normal position in the skull. This has been called "the law of the maxillary first molars." 2. The best results in the face are always obtained when all the teeth are in place and in normal occlusion. In regard to the first hypotheses, this dogma was bitterly contested by Case, a man of wide experience and keen observation, though he never was able to bring scientific data to prove his assertions. Many of Dr. Angle's older students never accepted it as final, though their work has been done on that basis. Recently, the work of Simon and Schwarz in Europe has scientifically and definitely proved that it is wrong and proves without question that the maxillary denture is in varying positions, anterior and posterior to certain fixed points in the skull, which are little influenced by the developmental growth of the denture. In regard to the second hypothesis, that the best results in the face are always obtained when all the teeth are in place and in normal occlusion, this is equally false. No real proof has ever been offered to substantiate it, nor can it ever be offered; while an abundance of evidence can be offered that it is not true. It is based upon the presumption that Nature never makes mistakes, a presumption that is not true. The extreme adherence to this dogma has had a detrimental influence on the advancement of differential diagnosis in orthodontia, and it has retarded and submerged the study of facial art and scientific orthodontic photography, an almost untouched field of the greatest value and usefulness. Under the influence of this dogma, photography for purposes of diagnosis and guidance in treatment has been practically useless, because "why study facial photography when the best results were always obtained by leaving the denture in its present place and producing normal occlusion?" Hence, orthodontic photography has been haphazard and unclassified. True, photographs have been taken, but only to show results after routine treatment, not as an aid to diagnosis and treatment. Here remains a field of fascinating interest and of vast usefulness and practical value in determining the real effect on the face of various procedures in therapy. With the aid of standardized photography and cephalometric diagnosis, the field of differen-

tial diagnosis opens wide and eagerly invites the earnest student. The error of the dogmatic application of the occlusion basis and the static position of the maxillary molar theory is that it assumes that the development of the bones of the face and head has been normal; whereas, we are faced with the fact that, in modern man, the bones of the maxilla, and especially of the mandible, are in a state of degeneracy as compared with the corresponding development in early man when the teeth were rarely in malocclusion and the jaws in complete development. But the teeth themselves in their size—in the amount of tooth substance—have not degenerated to a corresponding degree. Therefore, the amount of tooth substance and skull and face development must be comparatively studied, and this can be done only by cephalometric methods. When we throw away these obsolete and false dogmas and study conditions as they are in fact, not as they would be with ideal development, our progress in differential diagnosis will be measurably advanced, and when we adopt a method of standardized and systematized cephalography, our knowledge of the growth and changes in the face under specific procedures in treatment will show definite and progressive advancement. Orthodontia will be rescued from the deadening influence of routine procedure and take its rightful place as a science requiring the most diversified knowledge, as well as a high development of artistic discernment. I am perfectly aware that the legitimate application of cephalometric methods indicates, in some cases, the sacrifice of two or more teeth, and I do not hesitate to face this question squarely. While I do not yield to any man in my appreciation of the value and beauty of a full set of teeth in the majority of cases, I am emphatic in my belief that the interests of the patient will be far better served in some cases if some teeth are removed for security and certainty of retention and the enhancement of the beauty of the face. There are some other phases of this subject that I might profitably discuss, but I fear that I have already, to use an expression peculiar to Washington, "extended my remarks" to such an extent that I should apologize to Dr. Lischer for exceeding the limits of discussion and verging on a paper. To his expression in regard to "eclectism in appliances," I can heartily agree. The binding down of any school or individual to the use of any one appliance is foolish and unscientific and cannot be tolerated by any broad minded, intelligent practitioner. I am not enthusiastic over the possibility of extending the specialized technic of mechanical treatment of malocclusion to the great mass of people described by Dr. Lischer. In my opinion, the contribution of orthodontia to the vast majority must be in pointing out and emphasizing and teaching the ways of preventing malocclusion as revealed by the researches of Howe, McCollum, Mellanby and others.

W. R. Dinham, Portland, Ore.: "The Orthodontic Trend" is a most timely subject. It asks that we review our past accomplishments. It insists that our future method of diagnosis be governed by a realization that the denture has a definite relation to the head, and that intra-oral relations are not sufficient. It reveals the necessity of closer cooperation with the rhinologist, internist and pediatrician. Our attention has been called to the change in the manner of treatment of twenty years ago, to the light stimulating effect gained by use of small gage wires. The traffic on the road of human endeavor moves in two directions: there is progress and there is retrogression. Orthodontia has made most remarkable progress, but our thoughts have been directed to our deficient knowledge of etiology, for, in this field, progress must be made if we are to fulfil duties and obligations in the prevention of malocclusion. We can appreciate our president's message more fully when we realize that not only has he pointed out our deficiencies but he has also offered a plan worthy of serious consideration whereby it is possible to make real scientific progress in the field of etiology. Dr. Percy R. Howe has proved that dietary deficiency must be considered. Dr. Howard has produced evidence of the importance of recognizing Endocrine disturbances. Dr. Rogers discovered that lack of proper muscular tone is of serious consequence and must be given consideration. Other anomalies are thought to be caused by pernicious habits, early loss of deciduous teeth, artificial feeding, etc.; but what we need is a standardized form of examination that will include a complete case history; a body survey by a capable pediatrician, together with a diagnosis based on cephalometric relations of the

denture. Dr. Simon has supplied us with a method of diagnosis which, if accepted, apparently will meet our need for a complete classification of dentofacial deformities of the teeth and jaws in relation to the head. Our college clinics, as well as private practices, would then be in a position to supply standardized information, and when it was placed in the hands of qualified investigators, certain scientific conclusions might be reached that would enable us to make more rapid progress in the field of etiology.

PRESIDENT'S ADDRESS, SECTION IX*

By HENRY S. DUNNING, B.S., M.D., D.D.S., F.A.C.S., New York City

Ladies and Gentlemen, Members and Guests:

THIS is a most interesting occasion for us all. We are taking part in the celebration of an event that took place in this city about 150 years ago and which meant a great deal to this nation. I do not need to say much about our sesquicentennial, for you all are familiar, I am sure, with the big exposition that Philadelphia is staging here. I would like to say a few words about the great international dental congress that started so auspiciously yesterday morning and to state that we are delighted in having this meeting in America after all these years and to greet you most heartily and to sincerely wish you all a most pleasant and profitable visit.

This is an important meeting for us of the maxillofacial section of this great congress, for this section is a youngster. Being members of one of the youngest branches of surgery and dentistry, we, as yet, have not had many "parties" together of an international character. Eminent men in this new specialty from nearly every country in the world are gathered here today, and I am sure that we are all "straining at the leash" to listen to their words of wisdom—to hear about their experiences, to learn their methods, to understand their ideals; in short, to know our colleagues in our chosen field from many parts of the world.

As members of a young specialty of surgery or dentistry, I do not know which—it does not matter—we have many problems and we are most anxious to know how the "other fellow" is solving these problems, and that, after all, is the most important part of this entire meeting as it appears to me. By coming together as we have, with no other thought but friendship and the advancement of our calling, we should accomplish a great deal. I believe that it is our president, Dr. Logan's wish that the publication of our proceedings shall prove of great value not only to ourselves but also to the world at large.

As to our special field of surgery, I feel that being a young department of surgery, we are little understood by the medical profession and the laymen. We are not recognized as are the otolaryngologists, for instance, and few hos-

*Section on Maxillofacial Surgery and Surgical Prosthesis.

pitals have maxillofacial or oral surgeons on their staffs. I believe that the training a young man must have, at present, to enter our field is too long and not properly arranged and that at present much time is lost. I am sure that most educators feel that the future student does not need both the medical and the dental degree to be an oral specialist—that a student can learn all there is to know about the mouth and jaws and adjacent parts with one degree, if properly taught, just as well as he can understand all there is to know about the eye or the ear. I, for one, cannot see why a student should be compelled to take two professional courses covering a period of at least seven years in order to become an oral surgeon or a maxillofacial surgeon, when the best general surgeon or other surgical specialist may qualify by taking only the medical course and a hospital internship.

We in this country perhaps specialize in our medical and dental work more than is done in many other countries, and possibly our problem is a local one; but we are anxious to learn during this meeting how our colleagues in other lands are training their young men for this work. I believe that the basis of our work is surgical, and that to develop our specialty along the broadest and best lines, we must be trained in surgery as are other surgeons. If the student can be given a good medical and surgical foundation in college in four or five years, he can then obtain most of the special training in a proper internship in a special hospital as the student does now in training for other surgical specialties of the head.

There has been much discussion and agitation for the past few years in this country as regards what constitutes oral or maxillofacial surgery. I do not even know by which of the two names the specialty should be called. The term "maxillofacial surgery" was coined during the War. I know that the French and the British used this term at an early stage in the great conflict, for they rapidly learned that there was an urgent need for special surgery to care for the terrible injuries of the face and jaws; hence, the logical term "maxillofacial surgery" was created, and many centers were established in different parts of the countries then engaged in the great conflict. All the countries engaged in the Great War had developed maxillofacial surgery to a great degree before we came in, and this specialty was, in a way, one of the byproducts of those immortal years of strife. I do not mean to say that face and jaw injuries were not treated before the War, but that the War speeded up and helped to perfect this work to a great extent.

I feel that it is a most appropriate time to state before this great meeting our appreciation and gratitude for the help that our allies gave us in this line of surgery and other lines, such as orthopedics. Their great experience helped us immeasurably and aided us in obtaining much better results than we would have gotten without their assistance.

The title "maxillofacial surgery" was used in this country to a considerable degree during and after the War, and it took the place, to a great extent, of what we called oral surgery. Since

the war, in our civil work, we have reverted to the term "oral surgery," as this term is better understood by the medical and dental professions and the laity. I feel that the term "maxillofacial" is better as it describes our work more fully and has a much broader meaning and that a man who calls himself a maxillofacial surgeon is probably doing less dental surgery than he who is known as an oral surgeon. Names and degrees do not mean much, however. The thing that counts is the training one gets and what one does with such training after he gets it.

Coming to this interesting and important part of our discussion, the thought immediately comes to our minds: Where should oral or maxillofacial surgery be taught? One group of men will say the medical school, and another will say the dental school. And then, of course, the discussion will come up—does this work properly come under the heading of surgery or dentistry? And "the fat is then in the fire." It is interesting to note that our special field of surgery is practically untaught in any of our medical schools and, this being the case, many men feel that oral surgery is a branch of dentistry as it is taught in our dental schools. So, where are we now? Are we on the right track or are we evading the main issue? I think that our calling has come into being without anybody's taking much notice of it and has developed to a great extent as a useful specialty and one that fills a need in most civilized countries.

I have recently returned from France where I attended the second course given by the International Clinic of Oto-Laryngology and Maxillofacial Surgery. The work was well carried out and the course was most excellent in every way. It is interesting to note that it was given entirely by medical men in the St. Louis Hospital and in the Medical School of Paris under the direction of Professor LeMaitre, who is the ranking head surgeon in Paris, ably assisted by Drs. Ferris Smith of Grand Rapids, Eastman Sheehan of New York, and other distinguished surgeons. I do not recall one dental surgeon who assisted in giving instruction to the students, who were all but one medical men. This is a peculiar situation, and I think the question is a complicated one. It would rather appear that France, appreciating the need of our special department of surgery through her terrible suffering during the Great War, has been quick in realizing that maxillofacial surgery should be thoroughly taught and that it should be taught by surgeons thoroughly qualified to teach surgery and thus open her doors to men of different nationalities to establish the first international clinic of maxillofacial surgery. I may be absolutely wrong in my deductions, and if I am in error, I am most anxious to be corrected by the eminent men who I hope will favor me by discussing my presentation of our problems as I see them.

It is most important that we should have a free discussion as to our calling as regards the following: 1. What shall we call it—oral or maxillofacial surgery? 2. Are we satisfied with the present methods of teaching it? And where should it be taught in the future? 3. How and by whom should it be practiced?

PERIODONTIA'S CONTRIBUTION TO PREVENTIVE DENTISTRY*

By PAUL R. STILLMAN, D.D.S., F.A.C.D., F.A.A.P., New York City

IN opening the scientific program of Section X of the Seventh International Congress, it is my pleasure, as your presiding officer, to bid you all a hearty welcome. Never before in the history of scientific meetings has so sumptuous a feast been prepared for those who would sit at the table of that branch of dentistry which we call periodontia. At the sessions of this section, there will be introduced as essayists and discussers individuals who hold the highest place as authorities in this branch of dental science.

Credit for the assembling of this array, and the arrangement of the program itself, must go primarily to the most efficient and untiring secretaries in the entire Congress. Only through their effort and ability could so excellent a program have been built up. It seems but right that, in spite of their joint request that mention of their names be not made in this address, I should quote from a letter which reveals most clearly the element of greatness in these two women.

> If you are pleased with the work we have done on the program, and are satisfied with it, we are glad. We have not made our contribution for the sake of recognition for ourselves but for periodontia firstly, and secondly, for the women in the profession whom we have the privilege of representing and for those men of our profession who had belief enough in us to assign us to this post of responsibility and honor.

Regarding the program itself, I may say that it has been the policy of the officers of this section to make it eclectic; in other words, to gather into it contributions representative of varied opinions and schools. At the same time, it has been necessary to exercise a certain, more or less arbitrary, judgment regarding those things which seemed reasonable. This was needful in order that the perspective of the picture might not be unduly distorted by obviously empiric views.

We are met here with the object of becoming acquainted with the views of all and, thus broadening our own concepts of periodontal disease and its treatment. It is my solemn prayer that we may all return to our work with new knowledge and renewed ambitions, when this meeting is finished.

I have but one recommendation to make. I call attention to a growing evil. Nostrums for the cure of so-called "pyorrhea" have become too numerous and too common. It is a well known fact that the quack remedy always endeavors to sail in the ship of the latest scientific pronouncement. When the ameba was supposed to be the specific germ, the market was at once flooded with "pyorrhea cures" which contained emetin, the drug which was supposed to be the amebacide. If those remedies were valuable at that time; if their advertisements were truthful, why is it that we hear no more of them?

Today, science is endeavoring to determine whether or not radiant energy, of one sort or another, may be useful in the treatment of periodontoclasia. It is not strange, then, to find, in our

*President's Address, Section X (Periodontia).

journals, advertisements of pyorrhea cures that are said to contain radium and the like.

The American Medical Association supports a research laboratory for the investigation of so-called new remedies. I recommend that this section of the Congress memorialize the American Medical Association, requesting them to investigate such medicaments as pyorrhochrome, pyradium and any others of the same ilk. If these advertisements are truthful, we would be glad indeed to have the authority of the American Medical Association for their use. If they are useless, we would be grateful to have the American Medical Association condemn them.

The subject of this address is "Periodontia's Contribution to Preventive Dentistry." Periodontology became known as such with the founding of the American Academy of Periodontology, in 1914. The clarification of ideas which followed the establishment of that organization has contributed materially to the advancement of scientific knowledge in this field. Looking back over the years which have followed its founding, it may fairly be stated that the establishment of the Academy is one of the most important milestones in the progress of this branch of dental science. With the interchange of ideas made possible by this society, there was a steady crystallization of the knowledge of etiology, pathology and treatment, so that now the successful treatment of periodontal disease is established on a firm foundation.

Without making claims that we have learned all there is to know about treatment, for such claims would be foolish indeed, we can at least make the statement that our interest has increasingly turned in the direction of prevention. This has been a gradual transition, whose course it may be interesting to trace. At the time when it was first realized that so-called pyorrhea alveolaris was amenable to treatment, those practitioners who denominated themselves "pyorrhea specialists" were interested chiefly in the treatment of cases showing advanced disease with well-developed pus-pockets and marked inflammatory symptoms. As time went on, and they gained an increasing mastery of these cases through a broadened knowledge of etiology, they turned their attention to the cases less far advanced.

Here was observed a phenomenon which was to be expected, and which, nevertheless, has a story worthy of repeating; viz., that these incipient cases responded to treatment more rapidly and were maintained in health with less effort. As this progression toward the treatment of incipient disease was carried on, it was recognized that, in their essentials, the cases showing the earliest signs of disease were exactly the same as regards their etiology as the cases exhibiting the most advanced symptoms. In other words, the correct method of treatment was found to be the same whether the case was incipient or advanced. And with the realization of this fundamental fact came also the appreciation of the varied biologic forces that needed to be invoked in the scheme of prevention.

Prevention of disease is a term that may be understood in two ways. Particularly is this true as to the mouth. Obviously, preventive measures, in the strict sense of the word, should be applied in the mouth, or elsewhere in the body, while perfect health prevails. It unfortunately happens that many mouths show a certain departure from

health before the need of preventive measures is recognized. It is this conception of prevention that is largely to the fore in our thoughts regarding periodontal disease and even caries, today. At the present time, it is worth our while to concern ourselves with this phase of prevention for two reasons. The first is, that so few persons seek dental service until some degree of disease has shown itself in the mouth. The other is that we still have much to learn about periodontal disease, and these incipient cases are rich in possibilities for the development of knowledge.

The first departure from health is heralded by signs that can be observed by him who cares to see. While we do not always designate them as symptoms of recognized disease processes, they, nevertheless, are significant if only as indications of a departure from a state of positive health. I will not burden you with an enumeration of these signs, but I commend them to your study. They mark the dividing line between physiology and pathology. Our attention has in the past been given to pathology. Let us now turn to the study of physiology.

In function lies health. As long as function is normal, health will be maintained. When function is deranged, the portal is opened for the entrance of disease. True prevention, therefore, must be founded not only on the knowledge of disease and its etiology, but also on a study of the functions of the part whose derangement has given the etiologic factors a foothold.

Dentists have, in the past, known little of the physiology of the oral structures. Physiology, as taught in the dental colleges, has concerned itself with the principles as laid down by students in the field of medicine. They have taught the physiology of those organs in which medical men were principally interested. So it happens that, at the present day, there is no definitely developed physiologic science of the teeth and their supporting structures. As an instance of the meager knowledge of the dental profession in the science of oral physiology, let us take the function of the gingiva. Outside of the ranks of successful periodontists, knowledge of physiology is still a matter of superstitious ignorance. It is widely held by some dentists that the gums should be scrubbed vigorously because this form of violence makes them tough. Another group advise patients that the gums are tender structures and for that reason nothing harsh must ever touch them. Both of these superstitions arise from a lack of knowledge of the function of this structure, and both are wide of scientific truth.

The entire dental profession has, at this time, come to be interested in the study of occlusion, and in occlusion is bound up the function of the teeth. From this awakened interest of the present day, there should be developed the science of dental and oral physiology. The earliest studies in the function of the teeth were made by the prosthodontist. He was actuated more by the need of designing a mechanism with which the patient could masticate his food than with the need for studying the reactions to vital tissues. On the engineering principles which the prosthodontist developed, the periodontist has built, with the object of conserving the health of these vital tissues. Now, with the knowledge of physiologic occlusion developing, and with a knowledge of the effect of abnormal

occlusion on the health of the periodontium, we may turn to the study of the physiology of these parts for the advanced conception of preventive dentistry. That development along this line is logical has been proved by the success of preventive treatment as applied, treatment which is based upon present-day theories of the physiology of the teeth and their supporting structures.

In studying the requisites for health, as these things have been arrived at through the study of the cases of disease, it has been found that not only is normal function, as we commonly understand it, necessary to the maintenance of health, but also cleanliness, or at least freedom from various bacterial holding mediums, and a vigorous blood supply are of equal importance.

The presence of bacteria in the mouth is not of itself important. But, when these bacteria multiply in a favorable environment, they acquire a virulence that makes them active pathogenic agencies. They must, therefore, be deprived, as far as possible, of opportunities of multiplication. Such bacteria as are able to penetrate the epithelium (which is the first line of tissue defense) must be promptly disposed of by natural defensive forces. Here, a vigorously circulating blood stream is an element of prime importance. No less is the blood stream important from the standpoint of tissue nourishment and drainage. In these three things is summed up the philosophy of the prevention of oral disease as we now see it. This is, of course, predicated on the assumption of dental and alveolar structures having adequate physical development and an adequate dietary regimen for the body as a whole.

A striking phenomenon has been oftimes observed regarding cleanliness in the mouth. In mouths which were diseased and in which there was much accumulation of detritus, treatment was formerly given with the thought of assuring health through removal of these accumulations. Without commenting on the obvious part which this procedure played in the health program, attention may properly be called to the accompanying phenomenon. It is that these mouths, when brought to the condition of health, remained clean. The postulate has, therefore, been advanced that mouths become unclean because they are diseased, and, conversely, that healthy mouths are clean. In order that this state of affairs shall obtain, a high state of health must have been established.

The coincidence between uncleanliness of the mouth and gingival disease of varying severity has been so constant as to force the assumption that the two have a definite connection. Clinical experience in the field of prevention has borne out the assumption that, in the presence of an insufficient blood supply, the character of the exudate from the gingival mucosa is altered and thereby becomes a suitable holding medium for bacteria. To the blood supply of the gingiva, then, we have learned to turn our attention.

Nature's methods are always best, provided they are not perverted. The best means for securing an adequate blood supply is the natural usage of the teeth. The alternate compression and relaxation of the vessels in the pericementum and gingival tissues which accompanies the act of mastication provides the best possible means for accelerating the flow of blood in the

periodontium. Occlusional stresses are physiologic only when there is harmony, from the mechanical standpoint, in the dental apparatus.

The inference is clear that we must put balanced occlusion first in our list of dental health requisites, since without this we can hardly have an adequate blood supply. Unfortunately, even with balanced occlusion, the teeth may not, in these days, be used with that degree of vigor needed to provide adequate stimulation in the local blood stream. We, therefore, find it necessary in many instances, to resort to artificial means of supplementing this deficiency by artificially induced drainage.

These are some of the things that have been discovered in the field of periodontia, in an effort to bring health to diseased mouths. Whatever we may think regarding the blessings brought to suffering humanity through the efforts of the periodontist, I sincerely believe that the contribution of periodontia to the prevention of disease constitutes an outstanding achievement in dental health service. For, in function, if I mistake not, lie the essentials of preventive dentistry. These means are ready to the hand of him who would use them.

PRESIDENT'S ADDRESS, SECTION XI*

By HARVEY J. BURKHART, D.D.S., LL.D., Rochester, New York

To the Members of Section XI: Ladies and Gentlemen:

I ESTEEM it a great honor and pleasure, as President of this Section, to welcome to its deliberations, first of all, our distinguished colleagues from other countries, who have done pioneer work and rendered outstanding service in mouth hygiene and preventive dentistry, and also the members from my own country, whose interest in and devotion to the cause is well known and deeply appreciated.

I desire, particularly, to express my personal obligation to the officers of my section, both honorary and active, for their splendid cooperation in the preparation of this program. We are under distinct obligations, especially to our colleagues from abroad, for the interest which they have manifested in the preparation of the papers to be presented at the various sessions of this section. I am sure you will concur in the statement that the papers to be presented deal with every problem connected with the work assigned to this section. The authors of the various papers are regarded as authorities in the countries and sections from which they come, and whatever they may say to you will be the result of earnest devotion, long experience and mature thought and consideration.

It is my hope that there will be frank and open discussions of the subjects to be presented, so that the greatest amount of benefit may be derived from our deliberations. There is probably no other branch of dentistry in which conditions are changing so rap-

*Mouth Hygiene, Preventive Dentistry and Public Health.

idly as in the subjects to be considered by this section, and I may also say that there are none more important for the promotion of the health and happiness of the individual than these things that we are about to discuss. There is much work to be done along educational lines, not only with the public, but also with our own and the medical profession, before our ideals will be reached.

Many matters of vital importance, not only for the benefit of the public, but for that of the profession as well, must be considered here, and definite recommendations must be made to this Congress for final determination. Important questions relating to policies to be adopted for the conduct of our activities in the future must receive earnest and thoughtful attention. We are expected to formulate workable plans for the encouragement, assistance and guidance of those who will carry on public school, dispensary and health service work. I am sure much valuable information will be derived from an exchange of ideas and experiences.

Probably the most vital and generally important proposition that will be brought before this Congress will be presented by our distinguished colleagues, Drs. Schaffer-Stuckert, Bruske and Jessen, who have labored long and earnestly to promote the cause of oral hygiene. I refer to proposals of the Hygiene Commission of the F. D. I., passed at Geneva, Switzerland, last year. The carrying into effect of these proposals will mark a long and distinct step in advance, and result in placing the oral health movement upon a firm foundation.

I desire again to extend, on behalf of the officers of this section, personal greetings to our distinguished friends from abroad, and to express the hope that the time spent with us may be pleasant and enjoyable. To the friends at home, who have so splendidly cooperated with us, I want to express my deep appreciation for their helpfulness, kindness and courtesy.

I cannot close without expressing the deep regret that we all feel because of the death of our friend, colleague and vice-president, Dr. Charles H. Oakman, of Detroit. Dr. Oakman was one of the pioneer workers in oral hygiene, as well as one of the outstanding members of the dental profession in other branches. A true friend and a man of sterling worth and uprightness of character, he will be missed by a wide circle of friends.

PRESIDENT'S ADDRESS, SECTION XIII*

By ROY JAMES RINEHART, D.D.S., F.A.C.D., Kansas City, Missouri

Distinguished Guests and Members of the Seventh International Dental Congress:

SECTION Thirteen brings you greetings. Though sometimes called a doubtful number it represents, at this time, law and order, the basis of righteousness and of mutual understanding.

The officers appreciate to the fullest extent the loyalty and faithfulness of all who have consented to participate in this program. This is an opportunity for a better and a broader under-

*Dental Legislation.

standing of the legal needs of the profession.

Former Secretary of State, Charles Evans Hughes, in his address before the American Society of International Law, when it convened in Washington, is quoted as saying, "An international or world code must result from a series of conferences participated in by the nations of both the old world and the new. Restate, amend and enlarge the universal law-treating international law as obligatory and meeting each other on an equal footing."

The convening of the Seventh International Dental Congress is significant with the spirit of these words of Mr. Hughes, and especially do we trust that the nations here represented feel that they meet each other on an equal footing. Statesmen and leaders convene, argue and arbitrate, but after all, the fellowship of humble souls establishes the universal law wherein man may love his neighbor as himself.

This great conference is an important wheel within the machinery of international understanding. We meet on a common ground, are benefited, become better acquainted, and carry a message of confidence through the services offered by our profession to the entire civilized population.

Adequate laws are essential to protect and promote the best that the profession has to offer. The words of the immortal Abraham Lincoln bespeak the adequacy of law. "I believe," he said, "each individual is naturally entitled to do as he pleases with himself and the fruit of his labor so far as it in no wise interferes with other man's rights. The rights of people are protected by adequate laws. The liberties of individuals are promoted when a civilization protects these liberties."

Experiences out of the past teach that law is the basis of liberty and that all good law aims to establish progress, prosperity and happiness; but the necessities of the present demand that the scope of liberty be international, not local, and that legislation which aims at the betterment of the group necessarily curtails the liberties of individuals and minorities.

Law, whether written or unwritten, has existed from time immemorial. The origin of written law is interesting as derived from the three following sources: 1. The Hebrew Law, or the Bible, is the best authority ever written. It sets forth a law of justice and equity and is the most perfect code of ethics ever conceived. 2. The Roman Law as compiled by Justinian in A. D. 527-565 in his Corpus Juris Civilis. This is the source of nearly all modern law. Ihne says, "Every one of us is benefited directly or indirectly by this legacy of the Roman people, a legacy as valuable as the literary and artistic models which we owe to the great writers and sculptors of Greece." And Woodrow Wilson declares that Roman law "has furnished Europe with many, if not most, of her principles of private rights." 3. The Common Law of England as incorporated in her Magna Charta. This system of law has become more than a rival of the Roman Law. Without this rivalry, we may never have experienced the opportunities and beneficent influences of our present system. All law as we have it is essentially a growth, a historical development through centuries, a work which must continue, yet never be completed, and that growth depends for its efficacy on international cooperation.

An increased demand for legislation is inevitable, and the difficulty of

securing good legislation cannot be denied. Many of those seeking legislation do not understand what is the exact evil which they wish to eradicate or what good they desire to attain. If they succeed in discovering the source of the evil, they seldom know the proper remedy, and those who agree as to the end sought differ as to the means. It does not require much intelligence to discover a fault or to criticize, but it usually requires a deal of intelligence to correctly diagnose a social ailment and to prescribe proper legislation. Improvements in our methods of legislation are imperative—improvements that will adequately express the will of the people.

It has been difficult in every country to secure the ablest men as legislators. We need the idealist to supply us with a goal and point out the higher ideal, which will raise man to a higher plane. Although the road to that ideal may be a toilsome and tortuous one, requiring a generation or more of arduous efforts in education for its realization, the ultimate goal is worthy of the effort.

Our government supports profitably research in many fields. We would do well to provide for research in legislation with the view to securing valuable knowledge on legal problems for the benefit of our law-making bodies. How very valuable would be the reports and recommendations of an unbiased nonpartisan board composed of the ablest lawyers, sociologists and economists of our country constantly carrying on research work. It would study social and economic conditions and seek out needed legislation. It would review bills drawn by congressmen and lend advice before their presentation for enactment. It would point out discrepancies in existing measures; consider petitions from groups dissatisfied, and make reports and recommendations of prospective laws to congress in order that that body might have intelligent guidance in the final enactment of a law.

Creation of this research board should precede any attempt at recodification of our laws. To this board should be assigned the task of gathering information on the present legal situation, of interpreting the results found, of making recommendations and of devising a plan for attaining them.

Dr. Harvey W. Wiley, former chief of the Bureau of Chemistry in the Department of Agriculture, has interpreted many laws affecting pure foods and drugs and has had some of his opinions reversed by the department of justice and the President. In discussing this one day, he said: "The matter of interpreting laws is much like the story of the little boy who was told by his teacher to read something from a primer. The boy read as follows:

" 'This is a warm doughnut. Step on it.'

" 'Why, Johnnie,' said the teacher, 'That can't be right. Let me see your book.' "

This is what she found:

"This is a worm. Do not step on it."

Our program covers several phases of legislation relative to dentistry and dental practice. The adoption of all laws have been a process of evolution. Many are inadequate. Our legislative committee should be consulted more generally when laws are being framed or amended. Adequate dental laws are as necessary as progressive methods in dental practice. More uniformity is needed.

The final success of all legislation

lies in the character of our national constituency. "It is the distinguishing happiness of our government that civil order should be the result of choice and not of necessity, and the common wishes of the people become the law of the land; their public prosperity and even existence very much depend upon the suitable forming of the minds and morals of its citizens." This is the task of education.

I agree with Professor Holland of the University of Nebraska: "Men are becoming more humane, more benevolent and sympathetic, more regardful of the rights of others, more sensible of a common bond of humanity; and although the paths are still toilsome and oftimes discouraging, the race of man is constantly reaching a higher level by rising to higher conceptions of duty which in due time will find expression, embodiment and glorious fruitage in the still higher and better law of the future, built upon a firm foundation of equity and utility."

PRESIDENT'S ADDRESS, SECTION XIV*

By ROBERT T. OLIVER, D.D.S., F.A.C.D., D.S.M., New York City

I TAKE pleasure in extending a hearty welcome to all members and guests of Section XIV, Military Surgery. May the deliberations of its sessions in professional, military and scientific subjects be fraught with signal success, prove of appreciable value to the cause and develop a spirit of fellowship and mutual respect among the military men of the world.

The Seventh International Dental Congress, an activity of the Sesquicentennial held in celebration of the one hundred and fiftieth anniversary of the signing of that great human document, The American Declaration of Independence, promises to mark an important epoch in the history of dentistry.

In the midst of these shrines of patriotic devotion, at the very threshhold of Liberty, our hearts and our minds are filled with varied emotions. We thrill with admiration at the mental vision of that wondrous day—the assembled patriots waiting turn to step up and affix their names to the document—tense moments, those—dedicating their lives, their fortunes and their sacred honor to the cause; yet, with happy repartee, relieving the situation and preserving the charm of perfect dignified self-possession. Then: the rapid strident clatter of the bell, pealing forth that God-ordained message, molded around its flange: "Proclaim liberty throughout all the land, and to all the inhabitants thereof." You, my confréres from foreign lands, where ere you be, who catch the spirit of such contagious sentiment, join with us in mental review of those momentous happenings, that all may marvel at the wonders wrought on that occasion, which so well have reawakened the world, made incomparable changes in this fair land and given unheard of opportunities for advancement to its people, within so short a period.

Recalling our truant thoughts to the

*Section on Military Surgery.

duties at hand, let us consider the character of dentistry available in this country one hundred and fifty years ago. Such as was offered was found in the larger cities, with a scant following of itinerants in the lesser communities. As to type, those practitioners were of four general varieties—the sturdy, honest artisan who handled mechanical dentistry as a sort of side line to his regular trade, as the silversmiths and jewelers; barber surgeons or barber dentists, leaches and tooth-pullers, who still practiced in this far away land even though the royal edicts of both Louis XV and George III had already separated the respective vocations; the carvers of ivory and bone, with their ingenious artistry in attaching to bases the carved reproductions of teeth, or reset human teeth, with the retention of dentures by curved spiral springs; and lastly, the charlatan whose raucous voice proclaimed his superior skill in extracting and transplanting teeth, and whose handbills offered to pay 4 guineas each for good sound live teeth, "to be implanted in the jaws of the gentry."

During the Revolution, dentistry for both the patriots in the field, officers and men, and those left at home, consisted mainly of simple professional attendance from medical men for the quick alleviation of sufferings, a service in which the lancet and the modified pelican or the early type turnkey largely figured.

American dentistry may be called a heritage of war, its advent occurring during the Revolution, on the arrival of French convoys at Newport and Providence, in 1780-1781. With these troops came two surgeons of the French navy, Joseph LeMaire (Newport) and James Gardett (Providence), both educated medical gentlemen of the period, Gardett a graduate of the Royal Medical School, Paris. One of the required qualifications for a surgeon of the French navy at that time was the knowledge and a practical application of dentistry.

Let us remember that France then led the world in the science and art of dentistry. The doctrines of Pierre Fauchard, which constituted the first scientific treatise on dental surgery, as revised in 1747, were then in vogue. This volume set a higher standard for dentistry, which, claiming just recognition from medicine, resulted in a course of dental instruction being included in the curriculum at the Royal Medical School. Thus, James Gardett's debarkation at Providence heralds the arrival of the first medically trained dentist on American soil.

The friendly association of these two compatriots, mutually interested in dentistry, and their desire to improve health situations under their observation, moved them to undertake the instruction of a number of bright, intelligent young Continental soldiers, among whom was Josiah Flagg, the brightest, and hence the most favored, pupil of the group. This small class, marking the first instance of dental instruction in America, places Joseph LeMaire, its dominant figure, as the first American dental preceptor, Josiah Flagg, the first student, and the Newport camp the site of the first dental clinic—an item of special interest to Military dental men.

Such records serve to establish the facts that American dentistry, challenging alike the admiration and respect of the entire world, is, after all, the precocious offspring of military

dentistry, born in a war camp of the Revolution, suckled at the breast of patriotism, reared under service conditions and a perturbed post-war readjustment, trained under years of harsh experiences, yet always holding aloft the traditions of its ancestry, until finally it blossomed forth into full manhood, with a higher self-respect, greater importance to mankind and larger recognition as a worthy and a needful profession. Such full stature was obtained only through its own declaration of independence, made sixty-three years after the signing of the original document, which brought complete severance from medicine, the establishment of its own school and the creation of its own degree.

Of Horace Hayden it may be said that his was the honor of "bearing the torch of knowledge" from his illustrious preceptor, John Greenwood, a patriot of the Revolution, contemporary of Josiah Flagg, and later the dental practitioner to President Washington, down through the years to 1840; there to implant it as an everlasting shrine within the edifice of his creation, the first dental school of the world, an institution which served definitely to establish dentistry as a profession by proving to the world its full intent and its manifest preparation for perpetuity.

It may be observed that the basic principles of that initial class at Newport, well grounded upon the theories of Fauchard, and taught through the generosity of LeMaire and Gardett, were destined to become a large part of the very foundation of dental education, this again inviting to our attention the kinship of American dentistry to its humble military progenitor.

During the next fifty-eight years from the date of the separation, we find a period of gradual transition of dentistry from the status of a trade or vocation to that of a recognized profession. Wonderful development in professional attainments occurred during this period, abreast if not in advance of those in the other professions, in the active industries, or in the country itself. The organization of schools throughout the land, the creation of state laws and governing bodies for the practice of dentistry, the increasingly broader professional education, with higher preliminary education as a requirement for entrance, and the change from the one and two year courses of instruction to the universal three year course, all were important factors to such development. All such changes had the tendency to attract greater numbers of desirable young men to a career in dentistry, until, in 1900, we had approximately 30,000 practitioners within the United States.

During the Spanish-American War, in 1898, the last war fought by volunteers, we find large numbers of dentists in the ranks serving in grades from company officers down to privates—there were no opportunities for serving in any militoprofessional capacity. The presence of these representatives in the service, in addition to the fact that our dentally educated people early realized the dental needs of the mobilized army in the several training camps of the country, led to a reawakening of the dental profession to its long established ambition of providing a corps of dental surgeons for the Army. The National Dental Association seriously took up this question at its annual meeting in 1898 and appointed a special legislative committee to represent its interests in

the matter, to draft a bill and to undertake its passage through Congress. Avoiding details, it may be said that the efforts of the legislative committee in securing early enactment of their measure in time for service during that war were unsuccessful. The military campaign lasted too short a time to secure such special legislation, in the face of other more important military legislation. With commendable zeal, the legislative committee continued its efforts through the sessions of 1899 and 1900, which culminated in the passage of the bill, somewhat modified, it is true, with the general reorganization act of the Army, passed and approved, Feb. 2, 1901.

The advent of the Army Dental Corps marked an epoch in the history of dentistry. Its vast importance as a health service was quickly demonstrated in the military establishment. The presence of our small army of more than 60,000 in the Philippines, operating against insurgents, an army to which a majority of the newly appointed dental surgeons were transferred, and the type of primary dental service there rendered for the relief of pain and suffering readily accounts for the early and keen appreciation of this special service of the medical department. That the wisdom of its creation was proved many times over during the first three years of its service stands an unrefuted fact. Consistent effort was made by the National Dental Association from year to year, after the worth of military dental service had been formally established, to secure further legislation that would give full rights and privileges of commissioned officers to the Army dental surgeons. It was ten years before this was accomplished, by the Act of March 3, 1911, which granted commissions in the grade of first lieutenant to all dental surgeons then in the service.

The advent of the Navy Dental Corps in August, 1912, may be regarded as but a natural sequence, expected alike by the Navy, the profession and the citizens of our country. The manifest health benefits accruing to the military establishment, observed by higher ranking naval officers, ably assisted by the well organized activities of the National Dental Association, easily account for the lessening difficulty of convincing Congress of its necessity.

Provisions for promotion of dental officers came with the reorganization bill of June 3, 1916, which gave the grade of captain to those officers longest in the service with a promise of one extra grade under certain more or less discouraging provisions. It again required serious interference by the National Dental Association to secure equal rights for its dental representatives in the military service. This culminated as war-time legislation, on October 6, 1917, and immediately granted absolute equalization to dental officers in regard to rank, pay allowances and the rights of retirement.

The influence of the Army Dental Corps on our profession and our Nation has been alike beneficial. It has brought a greater recognition of dentistry and made for the popular appreciation of the profession. It has proved the forerunner to and a strong factor in all subsequent organizations of industrial dentistry and in institutional clinics (schools), in oral hygiene, both endowed and municipal, and, later, in the organization of dental service in

the United States Public Health Bureau. It was the pacemaker for organized military dental service in the armies of other nations. In general, it may be said that all such organizations have proved beneficial to dentistry as shown by the universal recognition of its importance as a health-conserving service by government agencies, state boards of health, the medical profession and civil communities.

The service of dentistry during the World War is one in which we all have an unbounded pride. The call of 6,000 dental men to the colors, under the provisions of the Act of Oct. 6, 1917, is the first instance in our history of dentists responding to the call of their country and accepting commissions in the military service as dental officers, in the various grades of rank. The establishment of such an agency through which dental men of the nation could give full expression to their patriotism and render special military service during a national emergency was of itself one of the most beneficial acts of legislation ever coming to any profession. It marks an epoch in the history of dentistry.

The commingling of dental with medical officers as professional brothers in arms brought closer understanding, mutual respect and increased benefits. The professional cooperation necessary in the great war hospitals brought higher appreciation of both the military and the professional value of the dental officer, as did their special surgical services rendered with face and jaw casualties of battle. Improvements in the understanding of each other's value also was augmented when medical and dental officers became brother students at the several schools in the A. E. F., and later in the home country; particularly so at the Medical Field Service School, Carlisle, with the assignment of a dental officer as a teacher in the Army Medical School and the organization of the Army dental school (1921), in which equal numbers of medical and dental officers constituted the faculty, with a curriculum arranged to embrace dental, medical and scientific subjects.

Since the War, we may trace the serious beginning of a general trend, the drift of dentistry back to the mother profession. It may truthfully be said that the Army Dental School stands out prominently as a high beacon light serving to attract attention and assist in directing the return of dentistry to the great professional highway common to all branches of the healing art. Medicine, surgery and dentistry belong alike to the health conserving service and to each other, if they are to confer the greatest benefits on mankind. Harmonious cooperation, close affiliations, complete understanding of each other's value and mutual appreciation are the prime essentials to such a coalition.

At the time of the separation, a chart would have shown the rather abrupt line of divergence from medicine, followed a little later by a change of direction, to a line exactly parallel to that of medicine, a route which it has traveled for approximately sixty-seven years. The present tendencies indicate a convergence of that line back to the mother groove, where it naturally belongs. Objection to such merger may be expected, possibly from both professions. From the dental standpoint, any act of recession from its splendid independence, having a tendency to cramp its style, will prove distasteful, and the

age-old tradition of resentment toward the sister profession, for indifference and condescension in past years, will have to be overcome by unmistakable evidences of amity and good will.

The great strides made by the younger profession in higher educational refinement, technical application and scientific study have been accomplished alone and unaided, and since it has reached the full stature of an honorable, able, respected and necessary health serving profession of scientific attainment, and recognized as such by our Government wholly on its own merits, quite naturally it looks with some degree of skepticism on any plan for coalition in which any compromise of its rights might be expected. Those men of both professions who believe in medically trained dentists must be prepared to encounter such opposition in addition to another equally important one economic in character—the increase in both years and fees necessary to the acquirement of a double education. Should the one degree be contemplated for one extended profession, the contention will concern a menacing loss of full technical education, and the possible degeneracy of art and fingercraft, all of which have served to make dentistry famous.

Referring to the military service, it may be said that until the great day arrives when, if ever, medicine and dentistry will actually coalesce and the dental corps possibly become a group of oral or dental specialists of the medical corps, it will be necessary for each, the medical and the dental corps, to operate more or less separately under the supervision of their respective heads, subordinate to the Surgeon General of the Army, director of the entire medical department. It further may be said that only with a chief of its own kind, under the supervision of the greater chief, the Surgeon General, complete autonomy under a protectorate (to borrow terms from the diplomatic service) and a personnel, both commissioned and enlisted, adequate to the full needs of the Army, can the dental corps ever be able to exploit modern dentistry satisfactorily in the service during peacetime or to reorganize its activities best for war. Such an ideal organization would of course require legislation affecting the entire medical department, as it would mean at least its partial reorganization. Speaking only of the dental corps organization in such a plan, it would require a chief of the Dental Corps selected from the senior officers of the corps, holding the grade of brigadier general (as would both the Medical and the Veterinary Corps under such a plan of department reorganization), the chief of corps to be vested with full authorization of law for the autonomous control of his corps under the protectorate of the Surgeon General and governed by specific instructions pertaining thereto covering every activity of his official administration.

Some such organization with a chief and an adequate personnel is bound to come in time, and it is hoped that our present Surgeon General, Major General M. E. Ireland, always a strong partisan for the dental service, may have both the opportunity and the great pleasure of celebrating its accomplishment.

In closing, I desire to express great appreciation of the manifest interest shown in the welfare of Section XIV, Military Surgery of the Seventh

International Dental Congress, by the attendance and cooperation of the splendid men of our sister nations and the equally representative men of American dentistry. My best wishes go out to our confréres present in the military dental service of their respective countries, with the hope that all they may seek in the way of improvement in such service may graciously be granted them.

DISCUSSION

Rodriguez Ottolengui, New York City: It is indeed most interesting, and to many it will prove enlightening, to learn that our American dentistry practically had its origin in two military men, Joseph LeMaire and James Gardette, both of the French Navy, who came over with the allied troups of Louis XVI, bringing with them the accepted knowledge of modern dentistry. Particularly does it appeal to those of us who recall the events and who participated in the great struggle to introduce regularly organized dental service into our Army and Navy. Having come out of the military service, how strange it seems, in retrospect, that subsequently it required so much energy to make dentistry an integral part of our great military department. Colonel Oliver recalls the period between 1898 and 1901 when the National Dental Association was urging the creation of a dental corps in our Army. He touches lightly on the provisions of that bill as finally passed, and naively adds, "somewhat modified it is true," but he fails to mention the fact that we were obliged to accept the so-called Contract Dental Corps, the active members of which had no standing as regular officers; a condition which was not corrected until 1911. There is a fact in connection with this state of affairs which should become a matter of permanent record. The creation of a contract dental corps, instead of an officered dental corps, was largely due to, let us say, the fear among military medical men that the dentist would not prove himself fitted to hold rank. It was, therefore, tremendously fortunate that such men as John S. Marshall and Robert T. Oliver should have been selected to serve as the first nominal heads of the newly organized Contract Dental Corps. Both of these men were War veterans and held medical degrees, I think, and both had already distinguished themselves in the field of oral surgery and as educators. What more splendid links could have been forged to unite the existing medical corps with the apparently insignificant little group of men known as the Contract Dental Corps. And what did these men do? Far from failing to conduct themselves in a manner befitting a soldier and an officer, it soon became apparent that they would not only grace such positions and render valuable service, but that, without rank of some sort, their usefulness in the Army would be greatly limited. Men in the ranks readily recognize their superior officers and take orders from them, but unless the soldier had been made to see that his dentist was, in a sense, his superior, whose orders and instructions must be obeyed, dental service never would have achieved the results that were obtained. The medical officers early recognized this fact, and themselves provided a remedy, through regulations, without waiting for further action of Congress. I well remember an incident during a visit to West Point: while walking from his quarters to the Academy Headquarters, at the side of Colonel, then plain Doctor, Oliver, I noticed that every soldier that we passed saluted him. This surprised me, and then for the first time I observed that Dr. Oliver wore shoulder straps. I inquired about this and was told that the straps did not carry rank insignia but merely the letters, "D. C." meaning Dental Corps, which, to the minds of the soldiers, converted the wearer into an officer, of sorts, and at once commanded respect. Not only these facts: the conduct of all these "hired dentists" was so correct that they were admitted to officers' messes and social entertainments, and to full companionship, showing that they were well received on a basis of social equality. There is no doubt that the splendid conduct of these pioneers of the dental corps helped to pave the way and make it possible for them to receive higher recognition and regular rank. I here appeal to you all to place the names of Marshall and Oliver side by side in dental history, with those of LeMaire and Gardette. The latter brought dentistry out of the military service, and the former again established it in the service, on an organized and highly respected basis.

Mark L. Finley, Washington, D. C.: The

exigencies of war have always led to development and to progress, in spite of the horrors that accompany its campaigns. In dentistry, the late War has developed skilful methods of treating major breaks of continuity in the facial, maxillary and oral regions, the marvelous results obtained exciting the wonder and the admiration of all professional observers. In consequence of my own activity in the earlier efforts to secure legislation for placing the dental surgeon in the military service, I have watched with jealous eye, the record being written, and I am fully satisfied that dentistry has played its part well through the men who have conducted its great performance tests through the years. I pay my respects to our presiding officer, Col. Robert T. Oliver, and to others who have written for our profession a record commensurate with the progress of human effort and advancement in other activities.

Henry S. Dunning, New York City: I wish to compliment Colonel Oliver on his collection of these most important data regarding the practice of military dental surgery. I was one of the members of the B. P. Club of the A. E. F., and feel that we members of the maxillofacial section of the Army owe Colonel Oliver a great debt for all that he did for us, in the early days of our work in France. Perhaps some of you present are not familiar with the B. P. Club of the A. E. F. The members of this Club landed in France prior to the coming over of our Chief, General Pershing, and laughingly formed a little club we called the B. P. Club, meaning Before Pershing. We saw the A. E. F. grow from a handful of men that didn't know what it was all about into a mighty organization of trained surgeons, dentists and other specialists, and incidentally combatants, who had gained much experience from our allies on many fronts. Colonel Oliver was always a tremendous help to members of the maxillofacial section, and more than once my Chief, Colonel Blair, and I went from our headquarters in Neuf Chateau to Colonel Oliver's headquarters in Tours to ask his advice and help, which was always cheerfully and enthusiastically given. The cooperation that was shown between the dental section of the Army under Colonel Oliver and our special branch of the surgical section was wonderful and I believe opened the eyes of the medical men in the armies of our allies to a great extent. The maxillofacial teams were worked out to a logical conclusion chiefly through the efforts of Colonel Blair and Colonel Oliver, and I think that, had the war lasted a little longer, we would have had the pleasure of showing many more wonderful results through the repair of the terrible facial wounds that the late war brought about. This section of the International Dental Congress is a most useful one, and I hope it will be perpetuated and the members' enthusiasm will continue, at least until the next war. It would be too bad if, during peace times, we lost track of the wonderful lessons that we learned during the time of stress and if we allowed our interest to lag to such an extent that these lessons that were so painfully learned by bitter disappointments had to be learned all over again by the coming generation of younger men who will carry this work on. In other words, I hope that we can keep up at least a skeleton section, with our records and data obtained during the War, for future needs, and be prepared to carry on where we left off in 1918.

PRESIDENT'S ADDRESS, SECTION XV*

By ALFRED P. LEE, D.D.S., Philadelphia, Pennsylvania

Members and Guests of the Seventh International Dental Congress:

IT is with feelings of peculiar pleasure that we address you on the opening session of Section XV of the present dental Congress. As stated in our foreword to the printed preliminary program, this section makes its initial bow at this Congress. Many of the subjects to be treated in these sessions have appeared in programs of previous

*Section on History, Science and Libraries.

congresses, but this is the first effort to have essays and reports on history, science and libraries grouped in what we believe to be the logical manner.

A general history of the world's progress necessarily contains much of fable, folklore and imagination. But dentistry, as a separate science, is relatively free of speculative historical matter. From the day when our ministrations were included among those of the physician, down to the present time, we have been able to follow fairly accurately the progress of dental science. During their years of practice, many men attending this Congress have seen dentistry make an advance equal in extent to the progress made during the entire period preceding their entrance into the profession. Thus, we may contend that the past twenty-five years has contributed more to dental science than has any previous period.

In ancient days, scholars and writers met at the shops to discuss the most recent manuscript or book. These meetings of the International Dental Congress and lesser groups likewise serve as pauses where we may discuss the newer methods of our work. Today, new materials, appliances and methods appear so rapidly, one on the heels of the other, that we must absorb what we can as they pass. It is at such meetings as these that we record on the pages of dental science the minutes of our great advance.

Our program for these sessions consists of essays or reports from representatives of England, Germany, Italy, Belgium, Austria, Denmark, Norway, Finland, Brazil, Uruguay, New Zealand, Cuba, the Philippine Islands, Porto Rico and the United States.

It may be of interest to the members to know that practically every historical essay on our program is presented by a man designated by the national dental society of his own country. Thus, we feel assured that the subjects treated will be presented in a manner and with an authenticity that could be assured in no other way.

While as hosts it is our desire that you attend as many of the scientific sessions as possible, we are not unmindful of the fact that guests should be accorded a diversified entertainment. The committees in charge of entertainment have arranged that, during your stay with us, you may see a considerable portion of our country and city, and we trust that your visit here may be one of much profit and pleasure.

Again we welcome you to the sessions of the Seventh International Dental Congress.

PROBLEMS OF EXTENSION AND ADAPTATION FOR IMPRESSIONS, WITH SPECIAL REFERENCE TO THE PERIPHERAL CONTACT*

By FRANCIS SCOTT WEIR, D.M.D., New York City

WHAT constitutes a proper impression for a denture? The history of the development of denture technics leads many to a point of confusion regarding this question. Opinions do not agree as to the amount of tissue compression that will permit normal physiologic function, on the areas of extension desired, or as to the manner in which peripheral contact should be accomplished. There are also many conflicting statements relative to the merits of different materials and to the technical variations in their manipulation.

Theoretical and practical observations have caused the advancement of certain technics, only to have many of them discarded and other new ones tried, because the former either were too complicated or did not seem to accomplish the promised results. Technics have been condemned and the use of some materials has been criticized and so discontinued; while in a number of instances operators have given up in disgust and reverted to the straight plaster impression.

We are all familiar with the development of denture technics, and presumably all, at some time or other, have experienced the thrill of constructing a denture by a new technic and having it fit in the beginning with strong suction, only later to hear from the patient, "It does not stay up."

These conditions naturally have given rise to confusion as to what is the best material and the best technic, and how much stability or suction can be obtained and maintained over a period of time. This is the natural result from the development of a technic of any kind. Trials, tests and eliminations are necessary before a standard procedure can be formulated. At the present time, a fair standard exists for maintaining stable, comfortable impressions.

The differences of opinion today are based on the manner of securing adaptation and the method of obtaining the peripheral seal. In the technical application of this, the issues among leading operators are (1) whether a technic employing modeling compound alone or one employing a combination of compound and plaster gives a better adaptation for a denture base, and (2) whether the peripheral seal should be obtained by extension to the soft tissue, making a soft tissue contact, or should be secured at the border by additions to

*Read before the Section on Full Denture Prosthesis at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 23, 1925.

the buccal margin, giving a pressure on the buccal wall.

This paper, therefore, will deal primarily with the amount of adaptation desired in the denture base and will consider both modeling compound and the combination of compound and plaster. Special reference will be made to extension and adaptation for the peripheral contact. A technic will be given to illustrate the application of these principles.

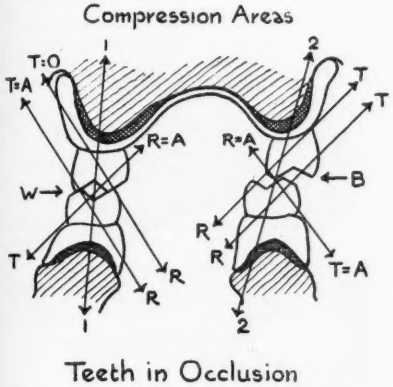

Fig. 1.—*1* and *2*, resultant lines of force; *T*, tilting force; *R*, retaining force; *A*, active tilting; *O*, not active tilting.

More failures are due, perhaps, to a lack of knowledge as to where pressure should be exerted on a denture base; to a lack of knowledge of the anatomy and physiology of the oral cavity, of the proper border outline and peripheral contact and of the amount of compression and displacement of tissue that takes place, than to a lack of skill in manipulating the materials in the sequence of any technic.

Adaptation of the denture base to carry the pressure is the first consideration. The photographs here shown illustrate where the main pressure is first exerted. Pressure is exerted by three forces of chief importance, namely (1) perpendicular force, (2) diagonal force and (3) pressure of the denture base by adaptation secured in the impression. A study of these forces indicates that the heaviest pressure is on the ridges near the crest, but as the denture is firmly seated, the pressure is exerted over the entire area except the reliefs. (Fig. 1.)

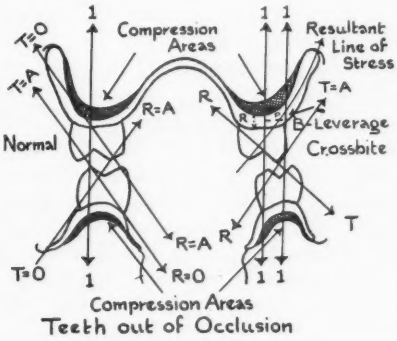

Fig. 2.—*T*, tilting action; *R*, retaining force; *A*, active tilting; *O*, not active.

When the teeth are in normal occlusion, the perpendicular force first exerts its pressure on the crest of the ridge; then, as the denture is seated, the pressure is distributed over the entire palate except the reliefs. If the occlusion is balanced, the diagonal force is minimized and has little effect on pressure. (Fig. 2.)

When the teeth are set for abnormal ridge relations, the pressure is greater toward the buccal surface of the upper and the lingual of the lower surface; but if balanced contact is secured, the area of pressure is again over the entire denture base except the re-

liefs. This is true for both the upper and the lower dentures.

It will therefore be seen that when the teeth are in occlusion, the tissues must resist or carry the pressure exerted directly on them. This is a resistive condition, and the equalization of pressure over the entire area is desirable. It is in this condition that modeling compound has, in principle, its greatest advantage. Whether this equalization is obtained in full compound impressions cannot be proved.

No instruments or methods are known whereby this pressure may be measured, and the shape of each arch varies so that amount of compression also varies. If the entire area could be enclosed, there would be compression, but since the posterior border is a flat surfaces, there is undoubtedly a displacement as well as a compression. A normal adaptation gives more permanent results in the majority of cases.

Many years of experience and a high degree of technical skill will undoubtedly give to a few men a better result with compound than with any other material. The amount of compression that will be tolerated is not known, but it is known that excessive pressure causes absorption. There is a change in the bony architecture of the ridge. The bone cells react to changes of pressure and become parallel to the lines of force. This is a physiologic reaction, according to Wolf's law. The pressure of a denture base on the ridge causes a greater density of the bone, a physiologic change, but excessive pressure causes a pathologic change. How much pressure, measured in pounds, causes this, we can only surmise. Cases are on record in which types of arches have been changed and soft tissue has been created on the ridges because of excessive pressure. The danger seems to come from compression of the surface capillaries. This is the reason that rebases, of lower dentures especially, cause absorption. The amount of force necessary to cause a thin layer of compound to flow in confined areas is such as to destroy the capillary blood supply, and absorption follows. Technics that call for the taking of lower impressions to secure an approximate

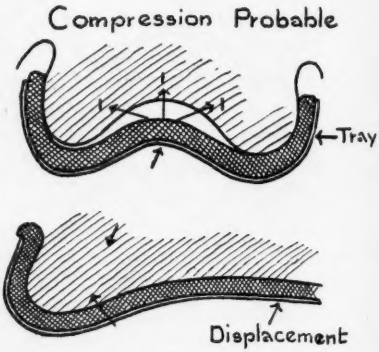

Fig. 3.—Compression probable.

fit and then the addition of a thin layer of material to make the final adaptation are therefore not indicated, for the amount of pressure necessary to cause the added compound to flow and escape is too great, except in very skilful hands. In flat ridges, this is not so probable as in those full, rounding ridges where the material is more confined. A plaster wash is safer in the hands of most operators, since it flows readily and does not tend to warp as does modeling compound.

I am aware of the fact that many men are successfully using modeling compound alone for taking impressions. For a number of years, I have studied

full compound technics and have been associated with many men who are using them. Observations have been made of its trials in universities and in postgraduate courses. Many cases have been studied over a period of years. The opinion resulting from this investigation is that, in the hands of the majority, modeling compound is likely to produce a warped base because of the many times it is placed in the mouth.

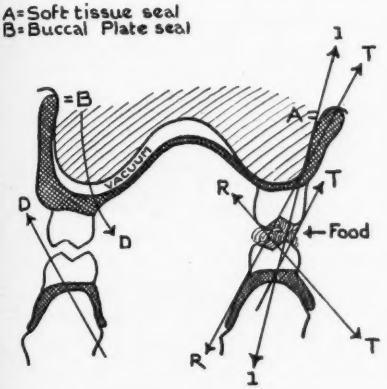

Fig. 4.—*T*, tilting force; *R*, retaining force; *1*, resultant line of force; *D*, displacing force.

Absorption is likely to occur on account of excessive pressure on the surface capillaries. In the hands of some technicians, it produces the best kind of an impression; but with it, practice and skill are required to secure the desired adaptation, but its employment is not generally practical for the general practitioners. With a combination, results may be secured that are as practical in adaptation and that permit of greater ease in manipulation than with compound alone. In brief, a good compound impression is the best kind of impression, but a poor compound impression is not so good as a plaster impression.

The next force for consideration is the one exerted when the teeth are separated by a bolus of food. Figure 4 shows the upward or resistive force on the side where pressure is exerted, and the displacement force on the opposite side.

In this case, the principle of retention is the one variously termed "atmospheric pressure," "partial vacuum," or "suction." This force can act only when the denture is displaced from the tissues and, as shown by several authorities, acts according to Boyle's law of gases.

This atmospheric pressure principle had its original application in the old vacuum or air chamber. The air chamber, being a partial vacuum, created a pull on the tissues by suction and, in a short time, the tissue was pulled down and filled the chamber by adaptation. Today, this principle is recognized, and the peripheral contact is secured to act as an air chamber on the entire denture base when it is displaced. When the denture is in contact with the tissues, this force is not active. If the denture could be held in a displaced condition over a sufficient period of time, the tissue would be pulled down and would fill in the area as it did in the vacuum chamber. The principle of atmospheric pressure in a denture has its greatest application in this manner. It is not necessary to illustrate Boyle's law of this action, since all are familiar with its principle as found in modern writings.

It is recognized today by all that a border contact or peripheral seal is necessary, and the only difference of opinion lies in the method of obtaining this

seal. As previously asked (Fig. 5), should the peripheral seal be made by extension up to soft tissue, or should we depend on buccal adaptation to the ridge? If at any point on the body where bone is covered with thin tissue, pressure is applied with a hard substance or there is any continuous pressure, a breaking down takes place, a pathologic condition results. For example, a person confined to bed develops bed sores; or an ankle brace must be padded or relieved at the joint. A

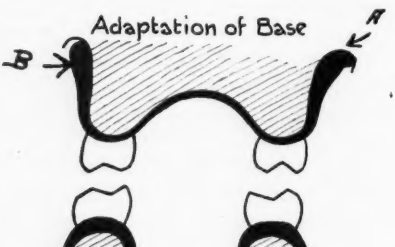

Fig. 5.—*A*, correct peripheral seal; *B*, incorrect seal.

postdam on the hard palate causes first a thinning out of tissue and, if repeated, absorption. This is what happens when heavy pressure is applied to the buccal wall to secure the valve seal contact. Contrast this with conditions where pressure is made on soft tissue that has no bone supporting it. An example of this is the abdominal truss, which is worn without discomfort or pathologic change. A postdam made on the soft palate, if it is not far enough back to interfere with muscle activity, produces a permanent seal.

A mechanical illustration of these two points is the valve in a pump. Figure 6 shows a view of a longitudinal cross-section. In the center, between two iron plates, is the rubber washer, and at the periphery is the valve contact. The valve contact corresponds to the extension of the denture flange up to soft tissue. The inside corresponds to the buccal tissue compressed between the flange of the denture and the buccal plate of bone. The valve seals at the periphery, but breaks only at the point

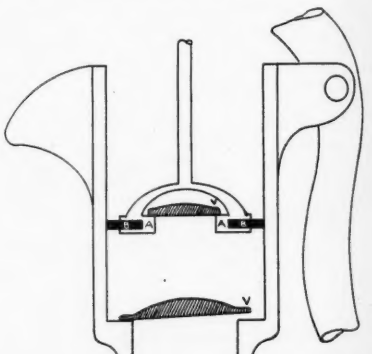

Fig. 6.—*V*, valve; *A*, metal seat; *B*, rubber washer.

where it is compressed between the plates.

This holds true in the denture if the pressure is made to the buccal plate and on the hard palate for the incising and lateral stresses, when the teeth are not in contact.

In cases observed where the peripheral contact or seal was maintained over a period of years with good stability, a normal adaptation was made next to the buccal plates and then a rounding extension up to the soft tissue. When pressure was applied to the buccal plates, suction was lost in a few months.

These observations and practical experience have shown that material added to the inside of the buccal flange to produce the peripheral seal tends to cause absorption and loss of stability. The extension of the flange up to soft tissue and of sufficient thickness to fill the buccal cavity and secure a contact with the buccal wall, such as may be secured with plaster, is the most permanent and effective valve, permitting normal functioning of the surface capillaries.

The third force to be considered is pressure of the denture from the denture base by adaptation from the impression. (Fig. 5.) In this condition, the teeth are not in contact and may be said to be in a resting position. Adhesion and cohesion are the retentive forces. If overcompression is secured in the impression, it will be exerted over the entire area, and in this is the greatest danger of interference with the capillary blood supply. If heavy pressure with a material of thick consistency is employed in taking the impression, the force will expel the blood from the surface and a shutting off of the capillaries will result, causing absorption. A material of thin consistency, one which readily flows with little pressure, is to be desired. It is for this reason that, in upper dentures, where the material is confined and cannot readily flow, a plaster wash is indicated in preference to compound.

With these principles in mind, a simple practical application will be made in a technic, starting with the upper denture.

TECHNIC

Select a tray one-fourth inch larger than the mouth so that the material may escape freely. There should be no high flanges on the tray. Heat the compound to 150 F. and shape in the tray to the approximate form of the arch, making contact in the palate first. Seat firmly to position to secure, chill thoroughly and remove. An oversized impression is desired. Mold the outline to make the peripheral contact. To mold soften the flange in a flame, temper in water and, holding in position, mold the buccal tissues down, the posterior buccal on each side first and then the labial.

The posterior border is very important. There is a notch at each tuberosity which is formed by the distal surface of the tuberosity and the hamular process of the internal pterygoid plate. The flange must fit in this notch without bringing pressure on either of these. Palpate, and with an indelible pencil mark both notches. Mark one-eighth inch distal to the end of the spine of the hard palate. Connect these three points with the indelible pencil. Dry the impression and seat to position, to transfer the tracing. Trim the compound to the line. To make the postdam, trace on the modeling compound, using the tracing stick, and seat to position. Remove, trim away excess, reheat and seat a second time. This makes a firm contact and one tolerant to the tissues. Relieve the posterior and anterior palatine canals and the median line to the extent of the hard area to a depth of 2 mm. Then cut a hole in the anterior median line one-eighth inch in diameter. To prevent heavy border pressure, trim the inside of the flange from the periphery down to within 5 mm. of the crest of the ridge. To complete the impression, make a thin mix of plaster, then cover the palate and the buccal surface with a thin wash along the inside of the flange. Seat firmly to position. When thoroughly set, remove. The crest of the ridge and postdam should show through the plaster. The flanges should show plaster up to the crest where the compound has been molded. This will give the correct buccal adaptation and the peripheral contact. The ridges will be in line for receiving the stress, but, owing to adaptation from the plaster, they will carry the stress over the area up to the reliefs. (Fig. 7.) It will be necessary to make a graduated relief on the model for the hard median area. This prevents heavy pressure on the median area, when the denture is under stress. Shellac and

sandarac the impression for pouring the model.

The lower impression is taken by trimming a tray to the approximate width of a lower denture, which is 15 mm. The tray is flat, but should have a flange of 8 mm. on the posterior lingual side. The posterior length of the tray should extend back to the angle of the mandible. Heat the compound again at 150 F., shape to the tray. Flame and temper in water. Seat to position, gently molding flanges in all directions. Chill and remove. Trim to the outline of the lower

Fig. 7.—Model illustrating technic.

denture, which is buccally the external oblique line, lingually the mylohyoid ridge, labially the cavity of the labial space, lingually-anteriorly the frenum of the tongue. The posterior length is the retromolar triangle. This outline is trimmed with a knife. Then soften the surface of the flanges all around, using the flame, and seat to position. Gently mold the tissues to round the margins. The posterior linguals should make a contact by having the tissues mold the compound. This contact should not be secured by digital pressure. This is done by adding compound, seating in position and having the patient protrude and place the tongue to the side. Chill, trim away excess, and repeat until no more excess shows.

If the ridge is flat, there is little danger of overcompression, as the material may escape in all directions. If the ridge is full and rounding, a plaster wash is indicated. If the surface of the compound is free from wrinkles and burned spots and shows a dull surface with clear detail, the plaster wash is not necessary. If a plaster wash is used, it is made in a thin mix and just enough to cover the surface. This plaster wash is then treated in the same way as for the upper impression.

The question of one material is not the primary consideration for a good impression. The chief thing to be considered is how to secure the outline, adaptation and peripheral contact that will give the greatest stability, the least interference with the capillary blood supply and the greatest comfort with the most permanent results. The material selected should be the one that the individual can use to the best advantage.

It will be seen, therefore, that the question is not whether full compound or a combination of compound and plaster is better for impressions, but rather which material the operator can manipulate better in securing proper outline, adaptation and peripheral contact. This, then, involves the personal equation, and is not a technical issue.

There are many men who, for good reasons, do not have the necessary time to devote to mastering complicated and difficult technics. A simpler technic which, at the same time, is accurate is the practical technic. When an accurate diagnosis of soft and hard areas has been made, of muscle attachments, prominent tuberosities and ridges, soft tissue areas and correct outline, and all the conditions known that must be taken into consideration in the impression, the technic must be modified to accommodate each case.

There are men who criticize some modern technics because they desire one

that will automatically produce a success for them in every case. They want to put a nickel in the slot and presto! a denture. They do not want to expend any effort or thought in order to produce results. This is not possible for good impressions, as practice, thought and effort are necessary for success along this line.

It must always be remembered that impressions are only one link in the chain and, while they are important, there are factors other than the impression technic that may be responsible for failure in many cases. Centric relation and occlusion, if not correct and balanced, destroy good impressions.

The mania that has existed for dentures with strong suction is gradually modifying itself to the point where reasonable stability is recognized as being the most permanent. For a time, if a patient could be lifted from a chair by the suction, the denture was considered marvelous. This led to overcompression and to disregard of correct centric relations and balanced occlusion, with trauma and absorption resulting. It is now known that such strong suction is not advisable.

SUMMARY

A good impression is one that has a border outline to soft tissue and the working positions of the muscles; that has an adaptation that carries the greatest stress on the ridge but includes the entire area, except reliefs; that has not sufficient compression to interfere with capillary blood supply, and that has a border seal that does not cause absorption.

In securing this, modeling compound in skilful hands seems to give the best adaptation, but a combination of plaster and compound is most practical for general use.

The peripheral seal should be made by extension with a rounding border to soft tissue and with a normal buccal tissue contact, and not by adding materials to the inside of the buccal flange of the impression; for such an addition tends to produce absorption.

Too much importance has been given to the sequence of steps in a technic and not enough to knowledge of the anatomy and physiology of the oral cavity.

Technic is the procedure of manipulating a material to conform to the requirements of an impression, and its sequence of steps should be based upon the diagnosis of each case.

No one technic fits all cases. Every case is individual, and effort and study are essential to produce stable and accurate impressions.

The technic illustrated is only one way of conforming materials to the requirements of each case. It is not original, but it is a combination of technics obtained by association with men in the profession. To these men, I give credit for the ideas here expressed.

DISCUSSION

W. T. Jacobs, Muskogee, Okla.: Full denture technic is pretty well standardized, so that there is really only one technic. It has slight variations in different hands, but, after all, we are trying to obtain the same results. This also applies to impression materials, and the confusion is not caused by the so-called many technics and materials, but a lack of knowledge and skill on the part of the dentist himself.

With the upper impression on what we will call a fixed base, hard, medium and soft areas, all of which must be adapted to accordingly, and tissue attachments that bring a dislodging force on the outer rim of the denture; with the lower impression on a base always in motion, tissue attachment on both

outer and inner periphery, and also a small narrow area to which to secure adaptation, what chance of real success for stable dentures has the man who does not know what and where these forces are and how to overcome them? There is no easy route to success in full denture construction, and the dentist who does not have vision, who is not awake to the opportunities of his profession, and has not the ambition and will-power to drive himself to become familiar with the area to which he is to fit a denture, cannot hope for a successful fitting.

It does not matter what material is used if the dentist is skilled in its use and, as the result, depends on the accuracy of adaptation. Therein, lies the success of a denture as far as the impression is concerned. He must be able to judge when he has obtained the best adaptation possible; an ability which comes from experience only. This judgment can not be other than individual, for one may obtain the same result with plaster, one, compound, and the other, compound and plaster combination. We all agree that there must be nearly perfect adaptation. Having obtained it, we must have correct occlusion, producing a direct force as nearly over the whole denture as possible except relieved areas, and, thereby, at all times, retaining our adaptation.

In my hands, I believe I am getting better results with the compound impression, and if one becomes familiar with the working of compound, he will get reasonable results. Balanced occlusion must be obtained if we expect our dentures to retain their adaptation, thereby causing less soreness and change to the bony structure by having the whole area to carry the pressure. First, we will trim and fit the upper tray to approximate shape, take a snap impression, pour the plaster snap cast and refit the tray, in order that, when we attempt to take the impression, we may not be handicapped with excess of tray and compound, thereby distending the soft tissues and defeating the results hoped for. The impression should only be extended as far as to secure air sealing on the periphery and should not distend or place the soft tissue in an unnatural position. For the lower impression, make a snap impression, using excess of compound to bring out as large an area as possible, pour the snap cast, and trace the ridge of compound on the crest of the plaster ridge. Fashion the individual tray, using soft metal, place in the mouth and determine whether the rim is short enough that soft tissue will not come in contact in forming the periphery. Use tracing sticks, and trace the compound on this special tray, sufficiently only to take the impression. The heat of the compound will heat the metal tray enough that it enables one to cover tray and get to the mouth with compound sufficiently soft to be seated, at same time having the patient swallow, move the tongue and, by pressure, form the buccal and labial periphery. I then proceed to adapt the impression in the usual way. First muscle trim the buccal, labial and lingual borders, putting the impression to all muscle and tongue tests. In this procedure with the lower impression, and with only sufficient compound, we are not handicapped by distending tissues, and it is much easier and a more accurate procedure to trace on a small amount of compound if needed, than to trim away an excess. We also have a metal stiffener to keep the impression from breaking. In both impressions, compound produced greater pressure on the inner half of the impression, because of being confined. By slight scraping, reheating and seating, this can be relieved, and, by this reheating, secure good adaptation. As Dr. Weir has stated, the periphery can be extended only to the soft tissue in its natural position sufficiently to produce an air sealed denture. Soreness is not always produced by overextension, but can be relieved by studying and correcting the occlusion. I want to give credit to those who have given full dentures so much thought and created a desire in us to take up the task where they have left off, and to further develop it. After all, an impression must have correct adaptation over all areas. It must be extended only sufficiently to secure air sealing and remain comfortable to the patient.

I. Lester Furnas, Cleveland, Ohio: I find it exceedingly difficult to prepare a discussion of Dr. Weir's paper, because he has so thoroughly covered his subject that there is little left to discuss. Much could be said if a few new phases of the subject or a variation of technic could be injected, but I should then be committing the one unpardonable sin of a discusser, that of not confining my remarks to the contents of the paper. It is an absolute impossibility to standardize an impression technic or material. The great variety of conditions that are daily encountered has established this as a fact. It is, therefore,

necessary for the prosthetists to be able to recognize, diagnose, and prognose these conditions and formulate an impression technic using the materials best suited to the conditions as found, and the skill in using these materials at his command. Failure must be expected in some cases, for it is only through failure that success is attained. The dentist who boasts that his denture work is 100 per cent successful is either showing a marked disregard for the truth or has eliminated this branch of dentistry from his practice. There is nothing so perplexing to the dentist and generally so unsatisfactorily solved in impression work as the subject of tissue compression. Here, the question of mouth examination and diagnosis plays a tremendous part. I have divided this into three classes: (1) tissue compression; (2) tissue displacement, and (3) tissue placement. Tissue compression is obtained by compressing the tissues upon themselves in the direction of the axial line of force during mastication. This is invariably followed by resorption, and may be used to advantage at times in treatment of cases in which soft rolling or flabby ridges are present. Tissue displacement is caused by the impression material driving or forcing the soft tissues out of their natural or functioning position and in the end causing absorption, and, in most cases, a varying degree of soreness. Tissue placement is obtained by forcing the soft tissues into a corrective position or correcting a displacement by proper tray formation. Modeling compound will, in every instance, cause one of these three conditions, varying, of course, with the skill of the operator. Modeling compound cannot be used in the mouth at a temperature above 150 F., and at this temperature it is decidedly in a molding stage and not a flowing stage, and will in every instance cause a varying amount of tissue change. If I were asked to place an estimate on the number of men in the United States who could manipulate modeling compound so skilfully in taking impressions that the resultant change would be so small that it would not be noticed, I should unhesitatingly say fifty or less. The three things that cause this change, producing tissue compression are (1) an ill-fitting impression tray; (2) an excess of impression material, and (3) impression material in the improper working consistency. It is, therefore, necessary in most cases, with an overwhelming majority of operators, to follow a technic of tray formation similar to the one outlined by Dr. Weir and a completed impression in soft plaster if the best results are to be obtained. The day of the denture with the sensational and temporary adaptation is past. For a permanent and an efficient result, all that should be secured is a comfortable adaptation to the tissues in their normal rest and relaxed position, except in those cases in which, for reasons of treatment, they must be handled differently. This combined with the three essential forces for denture success, which are adaptation, balanced occlusion and muscular training, will give the best and most lasting results. It has been well stated by Dr. Weir that the impression, no matter how nearly perfect, is of no value if the principles of balanced occlusion are not embodied in the denture. I do not care for the technic of tray formation as outlined by Dr. Weir as regards the cutting of the hole in the palatal portion of the upper. The peripheral borders of this tray should be trimmed almost as thin as possible and approximately one-eighth inch below the turn. This permits the tissue, after being displaced by the compound, to return to its natural position. As the final impression is taken in thin, almost water-like plaster of Paris, the slight excess is forced over the periphery of the compound tray, filling this turn in its rest and relaxed position. When the escape vent or hole is cut in the plate, the thin excess plaster of Paris follows the lines of least resistance and flows toward the hole in place of over the border and filling the turn. Dr. Weir speaks of "molding the buccal tissues." This term should be more fully explained. Molding of the tissues that is accomplished by massaging or drawing the tissues is a mistake, as it gives a false muscle trim to the base and materially lessens the base line or bearing surface of the denture. Molding of tissues should be done largely by the tissues themselves, without muscular effort, and with possibly a very little assistance in the form of a gentle directing pressure from the hand of the operator. The separating mediums should not be applied to the plaster until it has had ample time to dry. If this is not done, the moisture in the fresh plaster of Paris will prevent the penetration of the basic separator, and when the impression is separated from the cast, much of the thin plaster will be found adhering to

the surface of the cast and this is sometimes removed with much difficulty and loss of time. The chief thought touched upon by Dr. Weir and by far first in importance, is his work regarding the treatment of the borders of the base to establish a peripheral seal. This cannot here be enlarged on nor criticised, as his conclusions are both logical and practical. Any dentist building prosthetic restorations can profit by studying this part of the paper. I agree with Dr. Weir that a good impression can be taken in modeling compound; but he also believes that hundreds of men are using the compound technic believing that they are getting good results when in reality they are far from what should be considered satisfactory. It is my belief that a soft plaster of Paris impression, taken in a properly prepared and accurately fitting compound tray, is the most flexible, accurate and best impression that we have today.

C. J. Stansberry, Seattle, Wash.: Dr. Weir's idea is not for you to practice his technic without thinking of the reasons for doing it. The technic lends itself to aid your reasoning and is not comparable to one of putting a penny in the slot and getting results. I do not agree in his conclusion that, when an impression is taken under heavy pressure, the blood is forced out of the capillaries and that this condition would be reproduced in the denture, with the resulting destruction of the underlying tissue. The denture is only comparable to the form of the impression when this heavy pressure is released. I have long used the plaster wash, but I do not see its efficient application in Dr. Weir's technic.

As a scientific body, I think we should have greater regard for scientific definitions. Adhesion is the molecular attraction between unlike bodies, and the range of molecular attraction is about 0.00002 mm.; cohesion is the attraction between like bodies with the range the same. The words "compression" and "pressure" as used in the paper are to me confusing. Compression may be stated as a proportion of volume. A certain volume of gas may be compressed one-half. Pressure is always measureable in pounds per square inch, and these two terms should be carefully differentiated.

Ewell Neil, Nashville, Tenn.: Dr. Weir stated that too much attention is paid to detail and not enough attention paid to full adaptation; also that there must be an extension of the distolingual flange, but he did not tell us how far to extend it. We must also have an extension of the upper flange, and it remains with the individual as to what this extension must be.

Dayton Dunbar Campbell, Kansas City, Mo.: Some one has said that Wisdom is knowing what to do; Knowledge is knowing how to do it, and Virtue is doing it. What a traversity to applaud, unless we go back to our chairs and make use of the facts here given us. There is no difference of opinion now as to what constitutes retention—adhesion, atmospheric pressure, leverage, muscular control and gravity (we must mention gravity even if it is in most cases a negligible factor). In a given case, there might be some difference of opinion among our best operators as to the area that could be tolerated; in other words, the physiologic limit of the denture; but all will agree that only a small percentage of dentists take advantage of extending the dentures into the buccal space. Dr. Weir mentions this area that is a vulnerable point for the ingress of air, if the buccal tissue does not make slight contact with the denture. A novice might call this extension a "plumper," but it is in no sense an addition for esthetics, as it is just below the malar process and in the sparest type of individual would not effect facial contour. I am of the opinion that insurance against "valve leak" is best secured by plaster, as brought out by Dr. Weir; also by Dr. Stansberry in his paper at Dallas last year. In securing the postdam, I find that students affect this seal best, by the use of black carding wax. This soft wax is automatic in its action, since it compresses the tissue that needs compression and is compressed by the less resilient areas. Dr. Weir told us that if our central occlusion is not correct, the results obtained from a good impression will be lost. I will go further without fear of successful contradiction and say that well balanced dentures are more essential than good impressions, because ridges will adapt themselves in a measure to well occluded dentures, while the trauma resulting from maloccluded dentures causes a resorption of the underlying structure. This almost invariably takes place over a long period of time and where the dentures are worn with comfort. Comfortable dentures are therefore sometimes a delusion. We all recognize that

occlusion is the basis of all dental practice. Central occlusion should be the basis of full denture prosthesis.

Dr. Weir (*closing*): The discussions of this paper have emphasized several important points. Dr. Furnas refers to the expression "molding tissues" as being incorrect. It is true we do not mold tissues as we do an image of artists' clay, but, by definite areas and lines of pressure, we cause the tissues to form in such a manner as to mold or shape the compound beneath, to give height and form to the periphery of the impression. This is a technical expression used in dentistry and although it is understood, a better expression should be formulated by the Committee on Nomenclature. Dr. Stansberry has mentioned two or more purely technical expressions. The first one relates to the use of the word "compression," which he believes should be changed to "pressure." To analyze this, follow the seating of the impression material: it first makes contact, then, under stress, pressure is next applied to the tissue and, in the final stage, compression occurs because of pressure, and also displacement of tissue. The paper illustrates this point. The second expression was that of a "vacuum" resulting from Boyle's law; which is doubtful, since little or no air is under a well adapted denture base. There can be no permanent vacuum, I agree, for it would result in pulling the tissues down to fill the space. If there is a peripheral contact all around, when the denture is displaced under stress there can be nothing less than a momentary partial vacuum. It is only temporary, for the denture is reseated, and a careful reading of this portion of the paper illustrates clearly that no vacuum is maintained except at displacement. Any other illustrative term may be used but the condition exists in any case. The cutting of the hole in the tray and the viscosity of materials, I am sure the discusser has misunderstood. Laboratory tests show the plaster possesses greater viscosity than compound. The rim of the hole cannot show because the hole is cut in the area previously relieved in the compound and does not touch the tissues even without plaster. There is a thickness of plaster over the area of the hole. If any desire to use two escape holes instead of one, there is no objection. These are terms in use by the profession and understood as having the application here given. Clarification should come from the Committee on Nomenclature. The discussion of Dr. Neil gives a clear illustration of the posterior area as he has found it. There are many cases in which it may be used to advantage and is valuable when modified to each case and formed to tissue toleration. Dr. Campbell emphasized balanced occlusion. Occulsion, as mentioned in the paper, is the control. However, that is no excuse for a poor impression. A good impression adds to the efficiency of a denture, and better final results may be obtained if care is taken to secure the best impression in connection with balanced occlusion. This paper is on impressions only, not the relative importance. Good impressions are (1) the result of an understanding of all conditions of an accurate diagnosis, and (2) the employment of a material to the best advantage in a given case. There is no ideal material; there is no one material and there is no one technic for universal application.

AN APPRAISAL OF PRESENT-DAY ORTHODONTIC PROCEDURE*

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BECAUSE of the largeness of this subject, it is evident that only its most important phases can be touched on. We shall approach it from the point of education.

It is now approximately twenty-five years since orthodontia was segregated from dentistry, and reborn, as it were, as a specialty of the latter science. For many years thereafter, the small group representing this new specialty ever held before themselves an ideal toward which they valiantly strove. They surmounted unbelievable obstacles and laid a foundation for a more scientific and progressive orthodontia than is in existence today. This pioneer work in orthodontia furnished the inspiration that has been responsible in no small degree for the recent rapid and wonderful progress in other branches of dentistry.

As one surveys the horizon, he notes the influx to the specialty of large numbers, many of whom are wholly untrained. They have little or no conception of what it is all about. Many others are ill-trained. Some by nature but poorly equipped for orthodontic practice find their way into postgraduate classes, where all too little is done to improve their native defects. As to the postgraduate schools, usually the shortness of the course given precludes the possibility of their students carrying any clinical cases even to the retention state, much less to completion. Thus, they are not a party to the result, whether good or bad. We view with alarm the ever-growing tendency to sweep all true principles and ideals to the winds. Let us beware of the commercialization and lowering of the standards of a most worthy specialty.

The orthodontia departments of our dental colleges are subject to the same criticism; for much that is misleading, and more that is of little value, is disseminated by them.

Of all the branches of dentistry, orthodontia stands preeminently beneficial, esthetically, mentally and physically, to humanity. The wonder is that that fact apparently has not begun to sink into the minds of those who guide the destinies of the dental student. Too many of the institutions that pride themselves on their standards of teaching, and that place particular stress on the subject of preventive dentistry, offer courses of instruction in orthodontia so limited in scope and so inadequate in every requirement that the ultimate re-

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*Read by Dr. Dunn.

sult will be the undoing of much that has been accomplished by their teachings in preventive dentistry. Why try to build up a sound dental apparatus and then aid in wrecking it by promulgating poor orthodontia?

Many of the disseminators of such knowledge have little or no conception of the true principles and fundamentals of orthodontia. They think of it only in terms of appliances. Manufacturers have been quick to take advantage of this state of affairs and have broadcast extravagant claims for their appliances, which, more frequently than not, possess little or no merit.

Proper diagnosing is extremely important to insure results. To become proficient in diagnosis, one must have something more than a smattering of knowledge of etiologic factors and a chance acquaintance with appliances. He must have an appreciation of art. He must be endowed with a quickened sense of all that is beautiful in Nature. But this appears to be wholly lacking in many orthodontists. Wherein lies the fault? Mainly, in the methods of education. Is it not in order, then, that we begin to educate our orthodontic educators?

Such problems and many others could be more definitely settled by going out into the highways and byways of the orthodontic world and systematically gathering together really practical information. This should be the duty of our institutions of dental learning, if they are sincere in the desire to present to their students the real truths of orthodontia, rather than debasing the science by using it for a revenue-producing medium, engendering in the minds of the public a feeling of doubt or disgust for the products of their teaching.

It is most amusing to hear of operators confining themselves to a particular system of appliances, and advertising it to their clients, prospective and otherwise. No broadminded orthodontist confines himself to any one particular system of appliances, for they are only the means through which one may display his intelligence and skill. Appliances themselves are not endowed (as some would like to convey) with supernatural power.

Mechanical contrivances for the treatment of malocclusion of the teeth should embody simplicity, for in simplicity there is efficiency. Appliances should be of such simplicity as to permit their use in producing as nearly as possible those natural forces involved in development—forces for some reason perverted. Appliances should also allow accuracy in molar anchorage control. This is of paramount importance. Many of the appliances on the market today are wholly or partially lacking in these requirements.

In order to conserve time, we shall limit our appraisal of appliances to the following: the expansion arch with wire ligatures, the pin and tube appliances, the ribbon arch and bracket band appliance and the lingual arch appliance.

In the first-named appliance—the expansion arch with wire ligatures—which has been so generally discarded, we have the most efficient all-round appliance ever devised. With slight modifications, it can be used in expert hands in the treatment of almost any case of malocclusion, with quite satisfactory results. Used in the plain form on the maxillary dental arch in cases of Division I, Class II, it more nearly than others where intelligently handled, conforms in its action, to the natural controlling forces, lacking or

dormant. Again, when arrested vertical development in molars and bicuspids is present, its use, in combination with half staples soldered to labial surfaces of bands cemented on the anterior teeth of the mandible is ideal. Where reduction in size of either dental arch is desired, it has no equal. It also permits of excellent molar control. Its great fault, which is a serious one, is its bulk. It also inhibits proper prophylaxis.

The pin and tube appliance, in the hands of the average dentist and unskilled orthodontist, is contraindicated in almost all cases, because it does not permit of that proper facility of control so essential to good treatment. It is lacking in simplicity, and its assembling is too exacting on the operator. Generally speaking, there is little excuse, except in a few instances, for its use. There are more simple and efficient appliances to take its place.

In the ribbon arch and bracket band appliance, we have a highly advertised and sometimes greatly overestimated mechanism. Its use is fraught with danger even in expert hands, and therefore should be limited. It is contraindicated in cases of Class I, because of the availability of other appliances less bulky and unsightly and just as efficient. Its efficiency in molar anchorage control is fair, but where buccal movement to any extent is desired, it should be supplemented with the lingual arch. It may be used in the treatment of malocclusions of Division I, Class II, with good results when confined to the mandibular arch. In my hands, it has not been so efficient in the maxillary arch when arrested vertical development in molar and bicuspids is present. Its greatest efficiency is shown when it is used in the mandibular arch in Class III cases, in order to secure improved anchorage. Where subdivisions of Class II exist, one is hampered in its use, and in whatever type of case of malocclusion it may be used, caution and slow movement of teeth should be observed. Otherwise, root absorption, or even pulp involvement, may ensue.

The lingual arch with auxiliary spring attachments, when intelligently handled, would come more nearly to being the ideal appliance if it were not for its weakness in molar attachment. It does not allow of that accuracy necessary in molar anchorage control; but this will be overcome when a simple practical instrument is devised to care for its more accurate adjustments. It has no equal for the treatment of Class I cases, and, in combination with the plain expansion arch, in the treatment of cases of Class II, it is of great value.

It would seem unnecessary to mention the fact that time is a prerequisite in the treatment of malocclusion of the teeth in order to obtain proper results, if it were not for the broadcasting of extravagant and misleading claims of the promoters of certain orthodontic appliances. It is the concensus of opinion among all successful orthodontists of worth-while experience that, in the allowance of a fair amount of time in the treatment of malocclusions of the teeth, they more nearly comply with Nature's processes of development; and that should be the aim of all orthodontists, if the future of the patient's dental apparatus is of any concern.

If one will but stop and consider the nature of the tissues and organs comprising the dental apparatus, including such other tissues and organs as may be involved in the malocclusion, and the period of time covered in their nor-

mal development, it will not require much intelligence to see the fallacy and danger of too rapid treatment.

It is the tendency of men today to take a short-sighted view of things. Whether with medicine or dentistry, the thought is that such wonderful progress is being made that, in a comparatively short time, perfection will be attained. Such conclusions do not indicate a very profound knowledge or appreciation of the magnitude of the problems with which we deal. When it is realized that malocclusion of the teeth has been prevalent for centuries, and that it is practically inextricably interwoven with a multitude of racial faults or defects and errors of life, we can no longer hope that our problem is so nearly solved. We believe that our successors will be burning the midnight oil many centuries hence in their endeavor to find the answer to some of the questions we are asking today.

It is not strange that mechanics have played so important a rôle in orthodontic procedure. We know of no very consistent method of correcting malocclusion that does not rely on mechanics. Nor is it strange that there should have been developed devious methods that have gone into the orthodontic melting pot. Progress is not along a straight line; it follows a zig-zag course, often retracing its steps, discarding faulty methods as experience dictates. Thus, we should be patient with every honest effort that has been advanced and that may be advanced.

There is a tendency in some quarters to revive the question of extraction of teeth as an aid to the correction of malocclusion. It is worthy of note that, in the experience of many specialists of twenty or thirty years' experience, it has seemed unwise to extract teeth. Some of these men possibly have never removed a single tooth for that purpose.

Arch predetermination has claimed a certain amount of attention. Here again, the majority of specialists in orthodontia refuse to accept the theory that the proper placing of teeth in the human mouth can be determined by mechanical methods. These methods may offer some aid, but the young orthodontist will do well to realize that he will have to have within himself the ability to conceive what the normal denture should be, without depending on some fantastic formula to arrive at it. One has only to think of Hawley, Stanton, Gilpatrick, Strang and others to recall a great deal of interesting discussion along this line. More recently, Dr. Simon of Berlin has brought forward his gnathostatic methods for determining the proper relations of the teeth. His work is interesting, and doubtless has some value in its bearing on our general department of the profession of dentistry.

Most conservative orthodontists are convinced of one thing: that it is far better to have in mind an ideal conception of the human denture and strive to place the teeth accordingly, than it is to decide that some arrangement less ideal may apply, and then go rather blindly to work to establish that uncertain arrangement of the teeth. Only failure can follow such practice in the greatest number of instances. Too many workers already seek the way of least resistance. Let us not encourage such uncertain procedures.

In muscle culture, beyond doubt much has been accomplished that is interesting and beneficial by some of our enthusiastic workers along this line.

Dr. Rogers has consistently maintained muscle culture as a basic part of his practice with young children. Many of us who have applied it in a rather desultory manner are convinced of its value. However, it certainly must be borne in mind that this work calls for a degree of cooperation between patient, parent and orthodontist not hitherto contemplated. It is somewhat like conducting a kindergarten. Unless there is a sustained interest on all three sides, it is questionable whether much will be accomplished. It is recommended that every serious-minded orthodontist give earnest thought to this work, and apply it by degrees, selecting his cases in which it is to be used, and noting well the results.

Attention is called to the work of Dr. Harvey Stallard on the influence of faulty pillowing habits on the development of the human denture, and on the deformation of the face. A new field of study and observation is here opened that we will do well to heed.

From the trend of events, it seems in order to mention briefly the matter of compensation for services. As time is a prerequisite in the successful treatment of malocclusion, an orthodontist cannot treat large numbers of cases at one time with good results. An excess number of cases indicates cheapness of fees or ignorance, or possibly both. Cheapness begets slovenliness and indifference. These qualities are not the endowment of the master of detail, and the making of a successful orthodontist depends on the mastering of detail. John Ruskin, in that masterpiece which applies to all human endeavor, says:

> All works of quality bear a price in proportion to the skill, time, expense and risk attending their invention and manufacture. Those things called dear are, when justly estimated the cheapest. They are attended with much less profit to the artist than those things which everybody calls cheap.
>
> Beautiful forms and compositions are not made by chance, nor can they ever, in any material, be made at small expense.
>
> A composition for cheapness, and not for excellence of workmanship, is the most frequent and certain cause for the rapid decay and entire destruction of arts and manufactures.

Orthodontia, the most wonderful of all branches of dentistry, because of its benefits to mankind, is now the least understood and the most abused. Having in mind a remedy for this condition, we offer the following suggestions:

As education is the foundation upon which progress to greater achievement is made, our institutions of dental learning should make greater effort toward acquiring a more profound knowledge of the truths of orthodontia before embarking on a course of instruction that, at present, in most institutions, is little more than an amazing display of ignorance.

More time should be given to the investigation of the principles of tooth movement and mechanical and environmental factors, and less time to theories of a biologic nature, at least until the former have been more definitely determined.

There should be a more profound study of the temporomandibular articulation, its susceptibility to perverted forces exerted on the mandible, and the ease and rapidity in its adjustment to such conditions, that more logical reasons may thus be noted for the existence of subdivisions of unilateral, distal or mesial occlusions.

Careful investigation should be made of the excursions of the mandible and the influence of the curve of Spee, or so-called compensating curve, in the

maintenance of the mandible in its proper relation to the maxilla.

The influence of *use* in the early stages of the erupting deciduous teeth and, during their period of maintenance, their relation to vertical development should be studied.

The manner of absorption of the roots of deciduous teeth should be given consideration as a factor in influencing the positions of the underlying permanent teeth.

Finally, may we urge the serious consideration of the constancy of the typical vertical arrangement of the mandibular incisors and the reasons thereof, and that all important and prevalent phase of malocclusion of the teeth, arrested vertical development in the molar and premolar region.

DISCUSSION

Herbert A. Pullen, Buffalo, N. Y.: If the younger generation does not put its shoulder to the wheel of orthodontia as a specialty, it will not be many years before the wheel will have disappeared, and orthodontia as a specialty will cease to exist, reverting back to its parent dentistry, in which it will lose its individuality in the forging ahead of other specialties which may be fittest to survive because of their more aggressive qualities. Unfortunately, the endowed dental colleges, to which the opportunity has frequently been given to provide high class postgraduate schools of orthodontia long before the present date, are partly to blame for not carrying out plans for the establishment of the permanent educational foundation of orthodontia. Every orthodontist in the country would have been willing to stand by and assist in organizing such a school, and I do not believe that the zero hour has passed for the endowed dental colleges successfully to launch such an undertaking with a backing which will secure experienced teachers and a course of sufficient length to satisfy the most critical demands. As Dr. Dunn remarks, "The very institutions that pride themselves on their standards of teaching and who place particular stress on the subject of preventive dentistry, offer a course of a few weeks or months in orthodontia that will eventually result in undoing much that has been accomplished by their teachings in preventive dentistry." The reason for this superficial teaching in the postgraduate schools of the dental colleges, laudatory though the feeble effort may be, lies in a misconception of what "orthodontic procedure," is. The popular conception among the dental laity by whom the dental colleges are governed is that it consists in moving teeth into alinement by mechanical means. Hence, the orthodontic appliance is placed foremost in the minds of the students in teaching from this basis. On the contrary, orthodontic procedure consists of growing a jaw through proper stimulation to normal growth, and the removal of hindrances to normal growth, which may be both local and systemic in origin. The experienced orthodontist does not luxate teeth with appliances; often, he will restore normal functions after making a careful diagnosis of the various etiologic factors involved, as witness the classic work of Dr. Rogers of Boston, in muscle training in many cases of malocclusion in which no appliance has been used. Again, there are some jaws that cannot be made to grow, owing usually to some persistent etiologic factor, which, if not recognized at the outset of treatment, may involve the operator in a complication of difficulties which years of treatment will fail to bring to a successful conclusion. How is the inexperienced graduate of the short, inadequate course in orthodontia to learn of these conditions in the short time allotted to orthodontic teaching and practice? They are not included in his "daily dozen" of primary orthodontic concepts.

Furthermore, in the study of the inequalities of growth in the jaws, as observed by Drs. Dunn, Gray and others experienced in practice, the lack of vertical development in various portions of the jaws lends itself to the study of the keenest minds in orthodontia in order that these deficiencies may be overcome in treatment, and the mere dabbler in orthodontia cannot even recognize them. As another illustration of the time element in education as a necessity to produce perfection in diagnosis and treatment in orthodontia, I might point out that formulation and perfection of the gnathostatic and photostatic methods of diagnosis of dentofacial deformities by a German dentist required eight years of the

most painstaking effort. In discussing the time element in treatment, also, is it not evident, from what has already been said by Dr. Dunn along this line, that, looking at orthodontic procedure from the standpoint of stimulating and assisting Nature in the growth of the jaws, appliances guaranteed to complete a case in a few weeks or months are vainly attempting to beat Nature at her own game of growth, which is slow and gradual, requiring years for the unfolding of the completed perfect pattern of the dental arches? Breaking down alveolar structures by rapid application of force to the teeth is surgery of a sort, but not orthodontia. I agree with Dr. Dunn's suggestion that the remuneration for orthodontic services should be on a time basis, rather than on a basis of flat fees, although this suggestion is open to modification in special circumstances in individual cases. Dr. Dunn brings out to advantage the relation of diagnosis to treatment and the necessity of discovering the causative factors and contributing factors in malocclusion. While he has discussed the advantages and disadvantages of the more important types of appliances, he has not always stressed efficiency as the paramount qualification, but has recommended a simple appliance which will interfere the least with prophylaxis of the teeth. I cannot too strongly commend this high regard for prophylaxis in the selection of the type of appliance to be used in a given case. The labial arches and a multiplicity of incisor, cuspid, and bicuspid bands are uncalled for in many of the simpler cases of malocclusion, and they should not be worn for lengthy periods in the complicated cases of malocclusion. The ideal orthodontic appliance has never been discovered, and never will be, for no one appliance can meet the requirements of growth stimulation, prophylaxis, inconspicuousness, esthetics, etc. I believe that all of the valuable types of appliances have been invented and perfected to the nth degree so that the orthodontist may construct or select one or more for a given case, according to the requirements of that case, and this list should not be further increased to the increasing confusion of the novice.

Martin Dewey, New York City: It seems to be a tendency of the modern time for some of the older orthodontists to talk about the superior instruction given at that time compared to that given now. They make these statements regardless of the fact that they have never investigated what is being taught at the present time. Neither Dr. Dunn nor Dr. Pullen has ever been inside of a modern school of orthodontia. They have never investigated what is being taught and they claim the courses given twenty years ago of six weeks are superior to what is being given now in ten weeks. I think that is extremely unfair to the present courses of instruction. It also seems to be the tendency of other men to criticize postgraduate instruction. We are not going to get ahead without trying to find out what is right and what is wrong. The American Dental Association has a standing Committee on Dental Education whose duty it is to investigate dental education when instructed to do so by the House of Delegates. If this section is not satisfied, or is interested in existing postgraduate education and wishes information and investigation, the proper thing to do would be for this section to request the House of Delegates to instruct the Committee on Dental Education to investigate the efficiency of postgraduate instruction given today in all types of schools. Then the man wishing to take up postgraduate instruction will know what is good and what is bad. Dr. Dunn and Dr. Pullen have made that criticism with very little investigation. I doubt if either one of them has actually examined a course of instruction as given today. Therefore, I think the paper is unfair to present-day education.

Dr. Gray (closing): In answer to Dr. Dewey, it seems to me it would be quite in keeping with the present-day order of things if such a thing might be done. We are investigating the methods of teaching in the dental schools of the regular courses. I should think it would help to clear up these matters if we could have such an investigation, and then we should know more definitely what is being done. It would be in order with what is being done in the main teaching departments of dentistry of the regular course.

FACTORS INFLUENCING MOUTH CONDITIONS DURING PREGNANCY*

By JEWELL M. GOMPERTZ, D.D.S., New Haven, Connecticut

THOUGH it has long been known that there is a tendency for the teeth of pregnant women to decay, the factors causing the decay have never been thoroughly understood; in fact, they have not yet been adequately investigated. The newer knowledge of nutrition has shown that dietary factors scarcely recognized only a few years ago may exert a profound modifying effect on the development and the texture of the teeth. The nutrient demands of the growing fetus place a special drain on the reserves of the maternal organism, and, furthermore, the food habits of the pregnant woman are frequently modified for a variety of reasons during the period of gestation. The question accordingly arises, as to the extent to which diet may become responsible for dental disturbances or what beneficial effects it may exert. Indeed, the dentist is frequently confronted with uncertainty as to the extent to which dental work is either indicated or justified during this period.

The Prenatal Clinic of the School of Medicine, Yale University, has furnished the opportunity to investigate some of the abnormal mouth conditions of pregnancy, their possible causes and prophylactic measures with regard to them, in some detail. We have begun the collection of statistics that may ultimately throw some light on the questions at issue.

Each patient reported at the prenatal clinic has given information, and this has been tabulated on specially designed record cards, shown in the accompanying illustration. The classification of the patients with respect to the condition of the teeth and gums has been aided by the use of a color scheme, white card, class A, orange card, class B, yellow card, class C. The date, the full name of the individual, the address, the age, the number and the month of pregnancy, the nationality and race, are important from a statistical standpoint. The economic status is essentially what one would expect to find in the usual dispensary group.

The physical condition is determined by observations from a nutritional standpoint. Irregularities in previous pregnancy include miscarriage, instrumental deliveries, various toxemias of pregnancy, pernicious vomiting and eclampsia.

The references to teeth and gums in

*Report of the Prenatal Dental Clinic, Yale University, School of Medicine.

*Read before the American Academy of Periodontology, Louisville, Ky., Sept. 17-19, 1925.

previous pregnancies are derived from the patient's story. With respect to dietary habits, inquiry brings out whether the patient eats a well balanced diet or an abnormal amount of certain foods.

Under recommendations are included: precautions to be followed out by the patient during this period; roentgen-ray examination, prophylactic treatment, necessary extractions, and dental operations required.

In this way, I have gathered statistics and have followed, during the pregnancy, approximately 200 patients, including a few from my private practice, who are definitely of higher economic and social status.

From this series, we may draw the following conclusions: 1. The age, number of pregnancies and economic status exercise little or no influence on the condition of the teeth and gums. 2. The general nutrition and dietary habits seem to make a difference in the mouth conditions. We find that the women who are noticeably undernourished have more decay and periodontal disease. 3. As a group, the foreign born women come to us with better teeth than the American born. At our clinic, the greater portion of the foreign born come from southern and eastern Europe (Italy, Balkan States and Russia) and their economic status is certainly no better than that of the American born. Their diet includes less meat and more green vegetables. We cannot assume that their mouth conditions are due solely to difference in diet, as the result may be a racial characteristic.

Besides merely investigating causes, we have tried to prevent or remedy the mouth troubles of pregnancy. As early as possible, radiograms of the mouth are made, and necessary extractions of suspicious teeth and prophylactic treat-

DATE May 7, 1925

JEWELL M. GOMPERTZ D. D. S.
New Haven, Conn.

YALE UNIVERSITY PRENATAL CLINIC

Name Teresa Blank Address 24 Blank Street

Age 33 No. of Pregnancy 1-2-3-4-(5)-6-7-8-9

Month of Pregnancy 1-2-3-4-5-(6)-7-8-9

Nationality and Race Italian - White Exam. of Teeth (A) B C

Economic Status Husband is a Vegetable Peddler Exam. of Gums (A) B C

Physical Condition
Good

Irregularities in Previous Pregnancy
None

Condition of Teeth and Gums in Previous Pregnancy (A) B C

Dietary Habits—Milk Eggs Meats Fowl Fish Cheese Green Vegetables Fruits
\+ — — ++ ++ +++ ++

What is your chief food?
Green Vegetables, Cheese, Fish, Fruits

Recommendations
Dental Prophylaxis and Prenatal Instructions

Remarks No cavities. upper 1st Bicuspid (left) Root to be extracted, abscessed. Normal occlusion

ment are carried out, with advice as to the importance of cleanliness of the mouth.

If this procedure is followed from the beginning of pregnancy, there should be no need of extensive dental work. If the patient is not seen until late in pregnancy, whatever steps are necessary to put the mouth in a good condition should be taken. Only very extensive operative procedure is contraindicated, as is any major operation at this period. As a further step in prenatal care, our patients are advised concerning the diet. There is probably no time when dietetic advice is more acceptable than during the period of pregnancy. The earlier in that period that one can reach the mother, the better. Our patients are all advised directly by the dietitian, and the following suggestions are generally given, regardless of the stage of pregnancy:

Take daily: (1) one quart milk, (2) an orange and a salad if possible; (3) at least one vegetable (preferably green) besides potatoes; (4) meat, fish or poultry (once a day only); (5) from 6 to 8 glasses of water; (6) tea and coffee (one cup each only).

The foods must be simply prepared and easy of digestion. The amount of fresh vegetables and fruits advised depends on the financial situation of the patients. They are not urged to eat more than three good meals a day, but it is often easier for them to take some of the milk between meals. Special emphasis is laid on the need for milk and green vegetables in order to supply sufficient calcium. If the patient cannot tolerate a large quantity of milk, or if some metabolic disturbance makes a high fluid or high carbohydrate intake inadvisable, the calcium may be given as calcium lactate.

While the diet is of importance primarily as a factor in the normal and healthy outcome of pregnancy, we feel very strongly that it has a direct bearing on the teeth and periodontal membrane. The dentist, who often sees patients earlier in pregnancy than the obstetrician, can give helpful instructions as to what to eat, as well as education in the proper care of mouth conditions. He can help to dispel the traditional fear that dental interference during pregnancy is dangerous.

DISCUSSION

Justin D. Towner, Memphis, Tenn.: Dr. Gompertz is perfectly correct in the assertion that factors influencing mouth conditions during pregnancy are not "thoroughly understood" and have not been "adequately investigated." Proper nutrition, elimination, hygiene, exercise and rest suited to race, age, occupation and climate are the factors to be considered more seriously during pregnancy. Nutrition, most important under all circumstances, is least understood and therefore most neglected. A prospective mother should know the responsibility placed upon her at this time and not only provide every nutritional and hygienic advantage for herself and unborn child but also prepare or "train" for the advent as though it were an atheltic event. Through the placenta, the embryo exchanges the effete products of its own metabolism for oxygen and nourishment from the maternal blood. This indicates the duty of the mother in the matter of eliminating poisons and supplying increased nutrition to balance the excessive drain. In my opinion, faulty elimination or retention of these poisons is largely responsible for nausea in many cases, and the usual change in secretions, especially the saliva, so deterimental to mouth tissues. Elimination of poisons generated within the two beings places a strain on the

liver, intestines, kidneys, lungs and skin of the mother-to-be. Autointoxication resulting from retention of these poisons produces hyperacid secretions, high blood pressure, digestive disorders, albuminuria, neuritis, eclampsia, etc., each a distress signal which, if not answered, exacts a penalty. These abnormal conditions exert a detrimental influence on the bony structures of both mother and child. Diet in pregnancy, as above intimated, must be equal to the two-fold demands placed on it and the resultant elements be delivered in the purest possible form. Fortunately, the placenta, in its protective office, stands imposition well in most cases, but this does not justify too much confidence being placed in it, as far as the mother's protection is concerned. The diet problem resolves itself into a three-fold question: what to eat, when to eat and how much to eat. This must be answered by each individual according to physical needs and food function instead of mental relish and sapidity. When the necessity and simplicity of such a solution is generally recognized, we shall begin to take the *die out of diet,* as Dr. Macrae expresses it. During pregnancy, it is especially important to maintain a calcium equilibrium with sufficient intake of vitamin A to aid its assimilation, or fixation into bone. That diet has a direct bearing on the teeth and periodontal tissues during gestation is an undeniable fact, and one the dentist should always emphasize. The list of foods given by Dr. Gompertz is most practical except where it becomes necessary to make it conform to specific demands. I should add raisins to the list for their calcium lactate content and figs for their laxative effect. Calcium lactate in tablet form and activated cod liver oil may be given with beneficial results when the blood chemistry indicates and hydrochloric acid permits. Personal observation points to the fact that a carbohydrate breakfast, a fruit luncheon, and vegetable, preferably raw, dinner is beneficial except in diabetic patients.

CHANGING CONCEPTS CONCERNING ORAL SEPSIS*

By EDWARD C. ROSENOW, M.D., Rochester, Minnesota

IT seems to me appropriate to consider, on this occasion, the development of the important subject of the changing concepts concerning oral sepsis, the clinical and experimental observations upon which it rests, and the good that has already come from its application, and to estimate the benefit that may confidently be expected to accrue from it in the years to come. Moreover, since your commission has seen fit to present this award to me for efforts of my own in this field that bear so directly on dental problems, I may be pardoned for reviewing briefly results of my own studies, particularly the earlier experiments that led to the conception of the theory of elective localization, and to point out why investigators, aside from those who have worked with me, have, until recently, had difficulty in corroborating the experimental findings.

Nowhere in medical history is the value that comes from combined clinical observation and experimental inquiry better illustrated than in the development of our knowledge of focal infection. Notwithstanding the repeated suggestions made in previous years concerning the etiologic relationship, especially between acute localized infection and grave systemic disease, the medical and dental professions as a whole remained indifferent until Billings and his co-workers made their clinical observations and correlated experimental studies on animals, demonstrating the importance of localized infections, even though small and symptomless, as common sources of various systemic disorders. The broader conception of this interrelationship, well expressed by the term "focal infection," may therefore be regarded as having originated in recent years. I count myself fortunate in having been associated with Dr. Billings, to have been able to participate in this earlier work in Chicago and to have had the opportunity to continue my investigations in conjunction with clinicians at the Mayo Clinic in Rochester.

Aside from affording information concerning the pathogenesis of a series of diseases formerly not well understood, the work gave medical science a therapeutic principle of the utmost importance. Numerous reports on the relief of symptoms following the removal of foci of infection soon followed. The scope of this influence may be judged by the voluminous literature on focal infection that has since appeared throughout almost the whole civilized world. The benefits that have already accrued directly or indirectly are almost beyond calculation. It is not surprising that much speculation and opinion, often insufficiently sup-

*Address delivered on the occasion of the award of the Callahan Memorial Medal by the Ohio State Dental Society, Columbus, Ohio, Dec. 2, 1925.

ported by facts, have been indulged in, both by clinicians who often have little conception of the real significance of experimental studies and by purely laboratory workers who know so little of the clinical applications of their findings. All of the men who were associated with Billings and who did the experimental work had had both clinical and laboratory training and had intimate knowledge of the condition of the patient under investigation. Both types of study have value, but this could be greatly increased if the studies in this field could be made in collaboration or in closer cooperation. Such combined study is the crying need today, in the further working out of this problem. How much more might be accomplished if the many operators in the dental field, particularly root-canal experts, exodontists and dental surgeons, could correlate their clinical and radiologic findings with results of equally expert bacteriologic and experimental studies in animals than by attempting to evaluate the safety of the various procedures, such as root-canal work, by mere clinical observation, as is now almost universally done. It is a noteworthy fact that the results of my work in this field have been verified almost wholly by men who have had the necessary clinical guidance in the selection of material from patients, or who have had extensive clinical experience as well as a laboratory training.

The inability of certain investigators to corroborate my results would seem to be explainable on the ground of the improper selection of cases and material for study or of insufficient attention to technical details, as pointed out especially by Gay and Haden. The early results in studies on ulcer were corroborated by Hardt and Helmholz, those on iritis by Irons, Brown and Nadler, and those on cholecystitis by Brown. The elective localizing power of streptococci and colon bacilli from urinary infections has been demonstrated by Helmholz and Beeler. The results in the study of ulcer and arthritis have been fully corroborated, extended and controlled in my laboratory by Meisser, with streptococci isolated from infected teeth in the study of ulcer of the stomach and arthritis; by Nakamura with streptococci isolated from extirpated tonsils, and by Giordano with streptococci isolated from infected teeth and tonsils after the death of the patient. My methods have been used successfully in a study of the etiology of pyelonephritis and ulcerative cystitis by Meisser and Bumpus; by Moench in a study of the etiology of endocervicitis, in which she demonstrated that this condition is often due to partial-tension streptococci and may be a common cause of arthritis in women, and in a study of the etiology of chronic ulcerative colitis by Bargen. Price, working independently, has also reported corroborative results. The work on iritis and other diseases of the eye, on ulcer of the stomach and on pyelonephritis, as concerns dental foci especially, has been verified and greatly extended independently by Haden. Through strict attention to technical details, he has even succeeded in producing onychia in rabbits with streptococci from foci of infection in patients suffering from multiple onychia, an example of extreme specificity.

Certain investigators contend that all infections are focal in character. It is true that this is often the case in the microscopic sense, yet there is a fundamental difference between an area of

infection around the joint, as in chronic arthritis, for example, and infection in the jaw surrounding devitalized or diseased teeth, or in the tonsils containing dilated crypts with a narrowed or plugged orifice or an encapsulated abscess, and which, for mechanical reasons, cannot heal or drain.

In the systemic or secondary focus, the number of organisms is usually small; whereas, in the primary foci mentioned, the number is usually large. Again, there are those who say, "Why care about infected pulpless teeth or other foci of infection since the mucous membrane of the upper respiratory tract, and especially of the intestinal tract, harbors millions of organisms?" It is well known that normal mucous membranes are relatively impermeable to micro-organisms. In order to make the analogy more nearly correct, I would venture to suggest that the nerve supply to various segments of the intestines be cut off and that certain parts be wholly or partially ligated. Indeed, abundant evidence is already at hand in which systemic disease results from improper functioning of the intestinal tract from various causes, such as reversed peristalsis, kinks and adhesive bands, infected diverticula, and, especially, from an appendix whose orifice or lumen has become narrowed from scar tissue, the result of localized infection, or has become plugged by fecal concretions.

Clinical observations indicate that localized infections in certain structures, such as tonsils, teeth and sinuses, are more likely to be associated with systemic effects than those in other structures, such as the lung, in bronchiectasis, or the urinary tract, in cystitis and pyelitis. This may be due to a difference in the kind, number or invasive power of the bacteria in these locations or to peculiarities of the tissues harboring such foci. In general, it may be said that the harm which is prone to come from foci of infection is directly proportional to the lack of drainage to the surface. The more virulent the bacteria, the less they need a gross focus for entrance, and the lower their virulence, the greater the factor of focal infection in the production and maintenance of chronic disease. There is much clinical evidence indicating that foci of infection, as in tonsils, are often directly responsible for rendering attacks of acute infectious diseases more severe than they would otherwise be, and for increasing the incidence of complications, such as in diphtheria and scarlet fever. Foci of infection in the upper respiratory tract, as in the tonsils, may also be of epidemiologic importance, as is indicated by the suddenness with which the diphtheria-carrier state disappears after tonsillectomy. In fact, the question of focal infection in its broader sense is as wide in its scope and as difficult of proper application as is the practice of dentistry, medicine and surgery, combined. It cannot be applied by rule of thumb any more than can the healing art. A focus of infection that for mechanical or any other reason cannot heal or drain, that is teeming with organisms, often in mixed culture, must ever be considered not only as a favorable place of entrance but also as a good place for bacteria to maintain or acquire high and particular invasive powers. Clinical observations support these contentions, and experimental results have gone far to establish them. Thus, control experiments with cultures from the buccal mucous membrane, the surface of the tonsils and throat often proved negative, the animals usually re-

maining well and entirely or relatively free from lesions; whereas, strains from the depth of the focus produced characteristic lesions. Moreover, direct experimental proof of this fact has been obtained in the production of chronic foci by the devitalization and infection of teeth in dogs. Strains from patients with arthritis, nephrolithiasis and ulcer of the stomach, having elective localizing power, often retained this property for many weeks or months in the periapical structures of the teeth so infected; whereas, several aerobic platings sufficed to destroy it completely.

THEORY OF ELECTIVE LOCALIZATION

The best proof of the etiologic relationship of a focus of infection to a given lesion is the production of the lesion in animals with bacteria isolated from the focus in the patient.

Through the use of special cultural methods in which due consideration was given the question of oxygen tension and the injection of animals with the freshly isolated strains, extremely characteristic localizations were obtained with *Streptococcus viridans* from patients with subacute bacterial endocarditis, and with streptococci isolated from the joints of patients with rheumatic fever before the idea of elective localization occurred to me. The peculiar localizations obtained were considered due to different species of streptococci, rather than to peculiar temporary properties of different strains of the same species. It was not until ulcer of the stomach was produced in animals during my study on the transmutation of pneumococci and streptococci with "laboratory" strains that had attained a certain grade of virulence from successive passage through animals that the theory of elective localization took definite form. The long series of experiments in animals that have been performed since by myself, my pupils and independent workers leaves no doubt that the elective localizing power of the bacteria in foci of infection largely determines the location of the systemic lesion or disease a person with foci of infection is likely to develop.

This statement should not be taken to mean that this always occurs independently of predisposing factors. Exposure, trauma and fatigue of certain structures, improper food and bad sanitation, lack of sunshine, alcoholism and other excesses, undoubtedly lower the threshhold of local or general resistance and thus greatly increase the likelihood of elective localization of bacteria and other infective processes. Direct intravenous injection of bacteria that had grown in foci, such as those contained in small amounts of pus from tonsils, has often been followed by localization, with the production of lesions corresponding to those in the patient. Moreover, the specific affinity was sometimes so marked that it was not always necessary to give the injections intravenously. This observation answers an objection raised regarding large numbers of bacteria injected in routine work. Introduction of the bacteria in suitable dosage into the peritoneal cavity, the trachea, the brain, the stomach or the rectum, or into the nasal cavity by packing the nose with gauze soaked in the culture, was followed by specific localization in certain instances, especially when the more virulent strains were used, this supporting the clinical observation that systemic disease is not always attributable to a demonstrable focus of infection.

In order to remove all doubt regarding the importance of latent foci of

infection as an important factor in the production of disease, Meisser and I produced latent foci by devitalizing and infecting the teeth in dogs, thus closely simulating the conditions often inadvertantly induced in persons by dentists. Nephritis, nephrolithiasis, ulcer of the stomach, spasms of the diaphragm and other muscles, and chorea have been produced in this way with cultures isolated from patients with these respective diseases, and in each instance the causal relationship of the organism introduced into the teeth to the metastatic lesion has been established by the demonstration of the organism in the lesions and focus and by the elective localizing power of the strains isolated. During the latter experiments, another important fact was noted: The bacteria in the induced latent focus of infection, besides producing the characteristic disease, appeared to exert general deleterious effects. The animals lost weight and became more susceptible to intercurrent infections, although they were kept under conditions identical with those of control animals. In other words, conditions of hygiene and diet that were adequate to maintain weight and health in normal dogs were inadequate for dogs with latent foci of infection. The harm, therefore, from improper food or sanitation may be greatly exaggerated by bacteria harbored in foci of infection; a point not yet sufficiently considered.

In my experiments, still other important facts have been brought to light. Streptococci having the same specific localizing power were demonstrated in more than one focus in the same person simultaneously, and, in some instances, at intervals, in one or more foci, over a long period. These experimental facts are in harmony with the common clinical observation that persons affected with a particular disease, such as iritis, ulcer or arthritis, are prone to have recurring attacks of the same disease, which often tends to become chronic in character. In the light of these facts, the possibility that the tissues or fluids of the body afford the conditions on which the development of the peculiar localizing power of bacteria depends must be seriously considered. The hereditary tendency observed in some of these diseases also points in this direction, as does the repeatedly made observation that a higher incidence and more marked lesions occur in the characteristic organ or tissues of animals infected with the organisms from foci at the time of acute attacks or during acute exacerbations in chronic affections than during quiescent intervals. Moreover, well-marked differences in the incidence and severity of specific lesions were noted at different seasons of the year, especially in chronic ulcer and arthritis. During the colder months, when exacerbations and an increased incidence of these diseases are so common, the incidence of positive results in animals was appreciably higher than during the warmer months, when patients were relatively or entirely free from symptoms.

The fact that bacteria of the same species localize electively, depending on the degree of virulence or other acquired property, is no more remarkable than the fact that bacteria of different species tend to localize in particular organs or tissues. The loss of virulence of streptococci or other bacteria on artificial cultivation and its increase on passage through animals are well recognized. The change in localizing power likely occurs for the same reason.

The reasons for the elective locali-

zation of bacteria are still obscure. No doubt the same principles that determine the localization or pharmacologic action of chemicals and drugs apply here. Indeed, my experiments in ulcer of the stomach and epidemic hiccup strongly support this hypothesis. It was found that strains of the streptococci from patients with ulcer which had elective affinity for the mucous membranes of the stomach and which produced ulcer, on intravenous injections elaborated a poison or toxin within the bacterial cell and in the broth that had specific damaging effects. Injection of the washed dead bacteria and filtrates of actively growing cultures produced hemorrhage and ulcer of the stomach without inciting lesions elsewhere. Even more striking were the results following intracerebral injection of living cultures of the streptococcus from patients with epidemic hiccup, the dead bacteria, and filtrates of freshly isolated cultures. In each instance, spasm of the diaphragm or other muscles was produced. Moreover, filtrates of nasopharyngeal washings and pus from tonsils at the time of attacks sufficed to provoke spasms; whereas, similarly prepared filtrates, after recovery, were without effect. Aside, therefore, from the specific attraction or tropism of certain cells or tissues for certain bacteria, their localization and growth in certain tissues are dependent on the production of toxins or poisons that damage those tissues specificially. The specificity of some of the strains was so marked that intravenous injection in pregnant rabbits was followed by localization and lesions that were similar in fetuses and mother rabbits. The view held by obstetricians that foci of infection predispose to miscarriage or to the ill health of the fetus is supported by clinical and experimental findings. The far-reaching deleterious effects that focal infection may have even in conditions generally thought to be hereditary in origin are well illustrated by the work of Talbot, who says:

> The evidence tends to show that most congenital malformations which are the results of lack of embryonic development are not hereditary defects but acquired in utero; that defects in development are due to injury to the placenta during the early weeks of pregnancy; that the injury to the placenta is due to maternal hematogenous infection of the blood vessels of the placental site, and that the source of the hematogenous infection is generally to be found in the teeth and tonsils.

PRACTICAL CONSIDERATION

The practical applications of the principles of focal infection and elective localization are fraught with many difficulties. Systemic diseases, once thoroughly established and often associated with anatomic changes that in themselves may continue to give rise to symptoms even though there are no organisms present, may continue after all evident foci are removed. The instances of cure or arrest of progress in systemic diseases by the removal of foci of infection are so numerous that search for and removal of all foci possible is indicated in almost every case of serious systemic disease in which there is good clinical or experimental evidence of focal origin. In a given case, the variations in the invasive power of the bacteria, the wide differences in natural or acquired resistance to microbic invasion in different persons and at different times, the age and sex, the history of previous attacks, the duration and character of the disease from which relief is sought, and hereditary tendencies must all be considered in determining

when, or whether, all or certain foci should be removed, or whether the condition is indeed of focal origin.

To arrive at a correct diagnosis and to manage focal infection properly often requires the advice of specialists in the various branches of the healing art, as well as that of a competent bacteriologist. The opportunities of the dental profession have been greatly increased through a better understanding of the problem of focal infection in general, and especially of the dental area. Many problems are still unsolved, but enough have been solved to prove that prevention and elimination of oral sepsis should henceforth take precedence over preservation of the teeth, which has been practiced in the past almost wholly for mechanical or cosmetic purposes. Preventive measures should begin in childhood, with a view to obtaining proper development of the teeth and oral cavity. The principles underlying various procedures for the prevention and cure of infections of the gums and enveloping membranes of the roots of teeth are fairly well understood and effectively applied by many.

Infections of the dental pulp, pulpless teeth and apical abscesses are theoretically the most dangerous of the various forms of dental foci. They are usually free from symptoms and hence unsuspected. They are situated in osseous tissues, which allow no expansion. They can drain only into the circulation and are exposed to pressure transmitted by the teeth during mastication. They remain active for years, and the bacteria are not encapsulated, as is usually assumed, but are found in areas of active inflammatory reaction where the formation of new blood vessels affords drainage into the circulation.

The bacteriologic study and the animal experiments carried out by me, by Meisser and others working with me, by Price, and especially by Haden, prove that vital teeth free from caries are usually sterile but that practically all pulpless teeth removed from patients are infected, and that, with the organisms, usually streptococci, isolated, the disease causing the patient suffering may often be reproduced in animals. The infection is present whether or not the teeth show rarefaction in the radiogram. Moreover, it does not seem to make much difference whether the root canal had been "properly" filled or not. The idea of focal infection has often been wrongfully condemned because one or more pulpless teeth that showed rarefaction had been removed from a patient without benefit when teeth that showed no rarefaction were thought to be sterile and were left untouched, or when foci elsewhere were not even considered. Again, simple extraction of infected teeth is usually, but not always, sufficient to eliminate infection in the jaw. This seems peculiarly true if teeth have been rendered pulpless artificially. In the individual case, that method of removing infected teeth should be chosen which assures elimination of the infection, which is least destructive and which is associated with the lowest incidence of constitutional reactions manifested by fever and exacerbation of the systemic condition. Exacerbation following extraction of teeth should be regarded as experimental proof that the infection around the teeth removed has causal relationship and that in all likelihood not all of the infected tissue was eradicated during the operation.

A tooth from which the pulp has

been removed or which has died from infection seems to have a lowered resistance to bacterial invasion. The methods generally used in root canal work are certainly not adequate to prevent subsequent infection. The wholesale devitalization of teeth and the filling of root canals, often for trivial reasons, as practiced in the past, should, in the light of our present knowledge, be regarded as veritable experiments on human beings. It is to be hoped that an efficient method may be found that will not only sterilize pulpless teeth and periapical tissues that have become infected, but will also prevent subsequent infection, especially of the periapical tissues. The fulfilment of the latter requirement seems almost unattainable. Until this has been accomplished, it would seem wiser to remove teeth that have become infected or that require extirpation of the pulp than to retain them and have them become a source of infection later. No one deplores more than I the ruthless extraction of teeth that has been practiced in some instances as a result of the work on focal infection. Vital teeth free from pyorrhea should never be extracted except as it becomes necessary for restorative work. The extraction of pulpless teeth seems to me to be indicated, regardless of the appearance of the radiograms, in cases of serious systemic disease for which no other focus can be found. Good effects are especially prone to follow in cases in which it is possible to reproduce the disease in animals with the bacteria isolated. The results from the use of vaccines prepared from the strain proved to be guilty are also often strikingly favorable. Since the diseases that are commonly the result of focal infection are usually due to streptococci, immunity to which is of short duration, not too much should be expected from the use of specific vaccines or serums. They cannot take the place of removal of a cause, the focus.

The removal of foci of infection, particularly if the focus is situated in tissues that may be readily spared, such as tonsils and teeth, should be practiced in certain instances not only as a curative but also as a preventive measure. General deleterious effects, including lowered resistance to intercurrent infection, as well as specific localization, occurred in dogs in which focal infection had been induced artificially in teeth. This may be regarded as furnishing an experimental basis for the improvement in general health so commonly observed, and for the favorable results obtained in the treatment of diseases such as diabetes, syphilis and pulmonary tuberculosis following the elimination of foci of infection.

A careful consideration of all the facts now available indicates that a sane and comprehensive effort toward the prevention of septic foci and their cure, wherever found, will often result in the prevention and cure of chronic disease, in the alleviation of human suffering, in a better preservation of the tissues in old age, in a longer average duration of life, and in increased mental and physical efficiency, and will, through the laws of heredity, make for a sturdier race. Since focal infection is so common in the teeth and surrounding structures, the dental profession may confidently be expected to do its full share in preventive and curative medicine of today and of tomorrow.

OCCLUSIONS, JAW RELATIONS AND RIDGE RELATIONS*

By A. E. BOYCE, D.D.S., Tuscola, Illinois

IT is not the purpose of this paper to discuss the history or the development of our conception of occlusions. I shall present the views I accept. Occlusions in the past have been spoken of in rather a vague manner. Frequently, jaw relations, even ridge relations, were inferred. I accept a differentiation between occlusion of the masticatory surfaces, positional relations of the mandible to the maxillae and positional relation of the mandibular to the maxillary ridge.

A thorough understanding of occlusions and jaw relations is indispensable before complicating the issue by a consideration of ridge relations. The orthodontist, the periodontist, the crown and bridge worker and the prosthetist are confronted with the problems of occlusions, jaw relations and ridge relations at every step of their work.

The fundamentals pertaining to these are essentially the same for all branches of dentistry. This is a fact accepted by "all who know," yet we dentists are not fully in agreement on the subject.

You will find, in our recent literature, repeated efforts to solve the problem of occlusions and jaw relations via the articulator mechanism. Almost all these attempts were failures; while the reverse route led to useful results.

As stated, this paper will be confined to the study of occlusions, jaw relations and ridge relations and their associations. The basic principles laid down by Gysi and modified by Hanau are accepted. I draw your attention in particular to revised definitions of occlusions and jaw relations by Hanau, which, on account of their clearness, are here given.

OCCLUSIONS

Occlusions are contact relations of the masticatory surfaces. The main groups of occlusions are (1) ordinary (or normal) occlusions and (2) malocclusions. These designations apply to the tooth alinements, which either do, or do not, conform to accepted laws of occlusions, whatever they may be.

Ordinary occlusion is a contact relation of the masticatory surfaces conforming to accepted laws of occlusion.

Malocclusion is a contact relation of the masticatory surfaces not conforming to accepted laws of occlusion.

One subdivision of occlusions is given by the differentiation of balanced and unbalanced occlusions, and another by the differentiation of strained and unstrained occlusions. In consequence, ordinary occlusions may be balanced or unbalanced, and, in addition to one of these properties, strained or unstrained.

*Read before the Section on Full Denture Prosthesis at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 23, 1925.

Balanced Occlusions.—Balanced occlusion is a contact relation of the masticatory surfaces having contact at widely distributed single or multiple contact points or contact areas, thus tending to maintain equilibrium of the dentures. (The necessity of equilibrium for masticatory surfaces of natural dentures is an open question among authorities. I am inclined to accept the requirement of balance within a limited range of articulation.)

Balanced occlusions of the masticatory surfaces present contact in stable equilibrium, with the exception of centric occlusion, which must be in unstable equilibrium, presenting contact at two points or two multiple point areas, or two surface fragments, or two multiple surface fragment areas on either side about the second bicuspids and first molars.

Unbalanced Occlusions. — Unbalanced occlusion is contact relation of the masticatory surfaces, tending to disturb equilibrium when forces act. Unbalanced occlusion is always malocclusion for prosthetic dentures.

Unbalanced occlusions are occlusions having less than three point (etc.) contact, with the exception of centric occlusion. Unbalanced centric occlusion has one or two points (etc.) of contact. The occlusal contact of unbalanced occlusions is characterized by cusp interferences commonly leading to tissue trauma. Cusp interferences and tissue trauma induce a patient to accept unnatural occlusions and unnatural relations.

Strained and Unstrained Occlusions.—Strained occlusion of the masticatory surfaces is not an independent occlusion. It is associated with one of the above mentioned occlusions, whenever muscular forces act; i. e., when pressure is applied.

Unstrained occlusion of the masticatory surfaces is not an independent occlusion. It is associated with one of the above mentioned occlusions, whenever muscular forces do not act; i. e., whenever pressure is not applied.

Thus, ordinary occlusions and malocclusions, respectively, possess various

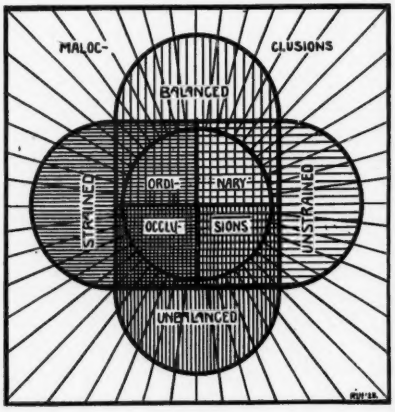

Fig. 1.—Occlusions.

characteristics. The situation becomes clear, if we graphically illustrate the problem of occlusions, as is done in Figure 1, which will serve to separate the various kinds of occlusion with different properties.

From this chart, we deduct that there are the following kinds of occlusions: (1) balanced strained ordinary occlusions; (2) unbalanced strained ordinary occlusions; (3) balanced strained malocclusions; (4) unbalanced strained mal-occlusions; (5) balanced unstrained ordinary occlusions; (6) unbalanced unstrained ordinary occlusions; (7) balanced unstrained malocclu-

sions, and (8) unbalanced unstrained malocclusions.

We are not interested in items 2, 4, 6 and 8, which comprise unbalanced occlusions of the various kinds, except that they are the occlusions which we wish to correct or avoid.

Occlusions under 1, 3, 5 and 7 are used for making measurements for transfers to, and adjustments of, the articulator.

The establishment of balanced occlusions is of utmost importance in the construction of dentures, and particularly in the alinement of the teeth. The dentures must ultimately function, be comfortable in the mouth and have a pleasing appearance.

We will now enumerate and define in outline the various individual occlusions to be considered. They also are taken from Hanau's "Dental Engineering:"[1] centric occlusion of the masticatory surfaces; protrusive occlusion of the masticatory surfaces; retrusive occlusion of the masticatory surfaces; left lateral occlusion of the masticatory surfaces; right lateral occlusion of the masticatory surfaces, and intermediate occlusion of the masticatory surfaces. Centric, protrusive, retrusive, left lateral and right lateral occlusion and, for reasons evident from the definitions, balanced and unbalanced occlusions are applied in a purely geometric sense; while strained and unstrained occlusions are used in a purely statical sense, implying the presence or absence of forces.

Balanced centric occlusion of the masticatory surfaces consists of an interdigitation of the cusps and incisal edges substantially as described by Angle, with the exception that the greatest intimacy of contact is accepted about the second bicuspids and first molars (rocking fit, or rocking occlusion, which infers unstable or more concisely neutral equilibrium).

Balanced protrusive occlusion of the masticatory surfaces presents the most intimate contact at the incisal edges and at both posterior extensions of the arches. The intimacy of contact decreases toward the second bicuspids and first molars. In fact, contact is lost toward these regions very rapidly, with an increased prominence of the compensating curves (stable equilibrium.)

Balanced lateral occlusions of the masticatory surfaces have contact along the working side and at the posterior region of the balancing side. The greatest intimacy of contact is found about the cuspids and at the last molar on the working side and at the last molar on the balancing side. The intimacy of contact decreases on the working side toward the second bicuspids and first molars, and, on the balancing side, toward the cuspid, with an increased prominence of the compensating curve. The contact about the cuspid on the balancing side is invariably lost (stable equilibrium).

Occlusions associated with an opening component of the jaws occur within the scope of articulation. The opening components with all occlusions are referred to the accepted centric occlusion of the jaws when forces are not acting; i. e., they are referred to the unstrained balanced centric occlusion.

All intermediate balanced occlusions of the masticatory surfaces are more or less related to centric, protrusive, lateral, etc., occlusions, depending on their spacial propinquity to these occlu-

1. Not at this time in print but in mimeographed sheets and drawings.

sions, and the magnitude, directions and points of application of forces acting.

JAW RELATIONS

Analogously to the occlusions, we differentiate jaw relations by their properties. There are ordinary (or normal) relations and malrelations of the mandible to the maxillae, and those may be balanced or unbalanced and in addition to one of these properties, strained or unstrained. For further detail on this subject you are referred to an article by Dr. Nelson,[2] giving extracts from Hanau's "Dental Engineering."

The positional relations of the mandible to the maxillae are referred to as jaw relations or relations only. The classification of these is analogous, almost like that of occlusions, as is illustrated by Figure 2.

From Figure 2, we read the following combinations: (1) balanced strained ordinary relations; (2) unbalanced strained ordinary relations; (3 balanced strained malrelations; (4) unbalanced strained malrelations; (5) balanced unstrained ordinary relations; (6) unbalanced unstrained ordinary relations; (7) balanced unstrained malrelations, and (8) unbalanced unstrained malrelations.

Again, we are not interested, for evident reasons, in relations listed under 2, 4, 6, and 8; while 1, 3, 5, and 7 are utilized for making measurements for, transfers to and adjustments of the articulator. Three and 7 are interesting also from the point of view taken in the text.

The relations of the mandible to the maxillae are those of the members of a hinge. The hinge pivots have freedom of movement within the bearing laterally and forward from and perpendicular to the walls of the pivot bearings. The latter freedom of movement is confined to the limits of resiliency of the tissues.

Rest relation of the mandible to the maxillae is the relation in which all tissues and muscles are relaxed to an extent counteracting the force of gravity only, while the "head is upright."

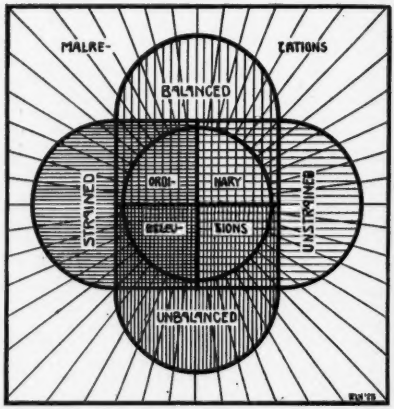

Fig. 2.—Jaw relations.

In this position, the jaws are slightly opened from centric relation, and the masticatory surfaces are not in contact. The rest relation has occasionally been referred to as the normal relation of the jaws. It shall not be considered so here. The rest relation is a relation used for checking an accepted opening relation.

Ordinary relations of the mandible to the maxillae are relations conforming to accepted laws of relations and associated with like occlusions.

Malrelations of the mandible to the maxillae are relations not conforming

2. Nelson, A. A.: Dent. Items Int., 1925-1926.

to accepted laws of relations, or ordinary relations associated with unlike occlusions. On rare occasions, it seems indicated that balanced centric occlusion of the masticatory surfaces should be associated with a protruded, a lateral or a protruded-lateral relation of the jaws. Such malrelation is selected in exceptional cases for weighty reasons, and should be considered a compromise, acceptable only if no discomfort to the patient results.

Ordinary relations and malrelations, on application of force, are or are not conducive to maintain equilibrium. Accordingly, they are balanced or unbalanced. Balanced relations of the mandible to the maxillae are relations associated with balanced occlusions. Unbalanced relations of the mandible to the maxillae are relations associated with unbalanced occlusions. Unbalanced relations induce a patient to accept unnatural relations.

Jaws in ordinary or malrelations, whether balanced or unbalanced, may or may not be under application of force. Accordingly, they are strained or unstrained.

Strained relations of the mandible to the maxillae are relations associated with strained occlusions. Strained relation of the mandible to the maxillae is not an independent relation; it is associated with a main relation or an intermediate relation whenever muscular forces are acting, i. e., when pressure is applied.

Unstrained relations of the mandible to the maxillae are relations associated with unstrained occlusions. Unstrained relation of the mandible to the maxillae is not an independent relation. It is associated with a main relation or an intermediate relation, whenever forces are not acting; i. e., when pressure is not applied.

We distinguish the following individual relations of the jaws: (1) rest relation of the mandible to the maxillae; (2) centric relation of the mandible to the maxillae; (3) protrusive relation of the mandible to the maxillae; (4) left lateral relation of the mandible to the maxillae; (5) right lateral relation of the mandible to the maxillae; (6) opening (or closing) relation of the mandible to the maxillae, and (7) intermediate relations of the mandible to the maxillae.

Rest, centric, protrusive, left lateral, right lateral and opening relation of the mandible to the maxillae, and, for reasons evident from the definitions, also balanced and unbalanced relations are applied in a purely geometric sense; while strained and unstrained relations are used in a statistical sense, implying the presence or absence of forces.

The mandible is in centric relation to the maxillae when the condyle heads are in their sockets, irrespective of the opening relation of the jaws. The mandible is in protrusive relation to the maxillae, when both condyle heads have made excursions forward and downward from their sockets in their fossae, irrespective of the opening relation of the jaws.

The mandible is in the left lateral relation to the maxillae when the left condyle head has made an excursion laterally and the right condyle head an excursion forward and usually downward and somewhat inward, irrespective of the opening relation. Right lateral relation of the mandible to the maxillae is a (mirror) image of the left lateral relation.

Opening and closing of the mandible

in relation to the maxillae infers rotation of the mandible about the accepted mandibular condyle axis, irrespective of any other relation of the mandible to the maxillae. The opening and closing relations of the mandible to the maxillae are not independent relations. Each is associated with other relations. The opening relation becomes definite for the artificial-denture-equipped masticatory apparatus, after it has been accepted for centric relation by the prosthetist.

All intermediate relations of the mandible to the maxillae are more or less related to centric, protrusive and lateral, etc., relations, depending on their spacial propinquity to these relations and the magnitude, direction and points of application of forces acting.

An understanding of the foregoing definitions of the occlusions of the masticatory surfaces and of the relations of the mandible to the maxillae gives us a means of a more intelligent interpretations of a case.

THE ASSOCIATION OF OCCLUSIONS AND RELATIONS

It is accepted that the association of occlusions with analogous relations constitutes the normal, if we may so designate the ordinarily contemplated restorations. An excellent table illustrating many desirable and undesirable associations of occlusions with relations has been compiled by Hanau. (Fig. 3.)

A study of this table will convince our most sincere optimists that missing the bite engenders most troublesome "foreign entanglements." In the end, we will therefore appreciate Hanau's recommendation "that all denture cases must be mounted in the articulator in unstrained balanced centric jaw relation, irrespective of the association of occlusions and ridge relations accepted or found, if a case is to be studied, diagnosed and possibly corrected."

RIDGE RELATIONS

The ridges, which serve as supports for dentures, are integral with the mandible and maxillae, respectively, and, with them, change their relative position. In speaking of ridge relation, it is intended to express the positional relation of the ridges to each other, when the jaws are in centric relation for an accepted opening relation of the jaws. Let us speak of the position of the mandibular ridge as being centric, protruded, retruded or lateral to the maxillary ridge. In addition thereto, we may have more or less opening of the ridges, which we shall express by giving the distance between the ridges in millimeters at their most anterior crests. Ridges are classified according to their forms, shapes, tissues, etc. We may also give consideration to their absolute sizes, or relate the size of one ridge to the other.

Frequently, we were tempted to diagnose a case that presents a wide lower and a narrow upper as an exceptionally abnormal case and a difficult problem. This is not always so, if we consider the accompanying conditions.

Ridges are not always favorably proportioned. One may be abnormally larger or wider than the other. The inclination of the tooth axes between the ridges may thus become unfavorable to the establishment of balanced occlusions. In such cases, it is well to modify other governing factors, notably the relative cusp height, in order to counteract the influence of the ridge relation.

Figures 4 to 10 schematically show the mandibular and maxillary ridges

OCCLUSIONS AND RELATIONS ASSOCIATED BY R.L.HANAU AVG 1925		RELATIONS OF THE MANDIBLE TO THE MAXILLAE								
		1. CENTRIC	2. RETRUDED (OR STRAINED CENTRIC)	3 PROTRUDED	4. LEFT LATERAL	5. RIGHT LATERAL	6. PROTRUDED LEFT LATERAL	7. PROTRUDED RIGHT LATERAL	8. RETRUDED (OR STRAINED) LEFT LATERAL	9. RETRUDED (OR STRAINED) RIGHT LATERAL
OCCLUSIONS OF THE MASTICATORY SURFACES	CENTRIC	A_0	A_0C_b	A_0B_1	A_0K_b	A_0H_b	A_0K_b	A_0H_b	A_0G_b	A_0F_b
	RETRUSIVE	B_0	$A_1B_0B_1C_c$	B_0B_1	B_0K_2	B_0H_2	$B_0K_2K_B$	$B_0H_2H_B$	$B_0E_2G_{II}K_2$	$B_0D_2F_{II}H_2$
	PROTRUSIVE	C_0	$C_0C_1C_a$	$A_1B_3C_0C_1$	$C_0E_2G_2K_{IV}$	$C_0D_2F_2H_{IV}$	$C_0E_2G_2K_4$	$C_0D_2F_2H_{IV}$	C_0G_2	C_0F_2
	LEFT LATERAL	D_0	$D_0F_bF_{II}$	D_0H_2	$A_1D_0D_1K_c$	D_0H_2	$B_bD_0H_bK_D$	D_0H_2	$C_2D_0F_2G_4$	D_0F_{II}
	RIGHT LATERAL	E_0	$E_0G_bG_{II}$	E_0K_2	E_0K_{II}	$A_1E_0E_1H_c$	E_0K_{II}	$B_bE_0H_DK_b$	E_0G_{II}	$C_2E_0F_4G_2$
	PROTRUDED LEFT LATERAL	F_0	$F_0F_1F_aF_I$	$D_1F_0F_1H_3$	$C_1E_3F_0F_1$ G_3K_V	$D_1F_0F_1H_{III}$	$A_1B_cC_1D_1$ $E_3F_0F_1G_3$ $H_cK_EK_cK_V$	$D_1F_0F_1H_{III}$	$C_1F_0F_1G_3$	$F_0F_1F_aF_I$
	PROTRUDED RIGHT LATERAL	G_0	$G_0G_1G_aG_I$	$E_1G_0G_1K_3$	$E_1G_0G_1K_{III}$	$C_1D_3F_3G_0$ G_1H_V	$E_1G_0G_1K_{III}$	$A_1B_cC_1D_3$ $E_1F_2G_0G_1$ $H_EH_cH_VK_c$	$G_0G_1G_aG_I$	$C_1F_3G_0G_1$
	RETRUDED LEFT LATERAL	H_0	$D_1F_{III}H_0H_1$	H_0H_1	$B_1H_0H_1K_3$	$H_0H_1H_aH_I$	$B_1B_aH_0H_1$ $H_aK_3K_C$	$H_0H_1H_aH_I$ H_A	$A_1B_1C_3D_1$ $E_3F_3G_6G_c$ $G_IH_0H_1K_3$	$D_1F_{III}H_0H_1$
	RETRUDED RIGHT LATERAL	K_0	$E_1G_{III}K_0K_1$	K_0K_1	$K_0K_1K_aK_I$	$B_1H_3K_0K_1$	$K_0K_1K_aK_I$ K_A	$B_1B_aH_3H_C$ $K_0K_1K_a$	$E_1G_{III}K_0K_1$	$A_1B_1C_3D_3$ $E_1F_5F_cF_V$ $G_3H_3K_0K_1$

Fig. 3.—Occlusions and relations associated. (From Hanau.)

associated with their respective jaws in various relations.

Figure 4 illustrates mandible and maxillae in centric relation for an accepted ideal opening relation with the mandibular and maxillary ridges in an equally ideal centric relation. On retaining centric relation of the jaws, but closing the same, we produce a ridge relation illustrated by Figure 5, in which the mandibular ridge assumes a more tightly closed and protruded relation.

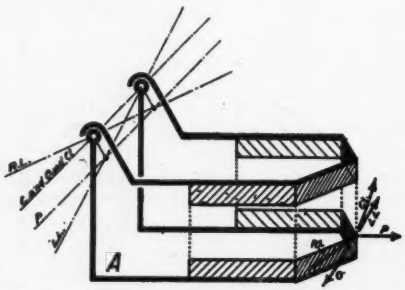

Fig. 4.—Centric relation of the jaws associated with centric relation of the ridges accepted for an ideal opening.

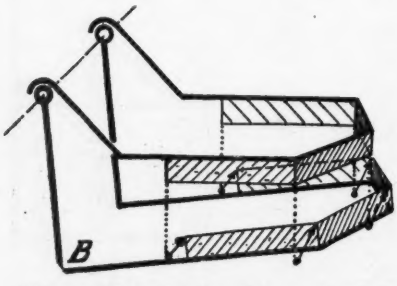

Fig. 5.—The association of jaws and ridges shown in Figure 4, but closed.

In Figure 6, the jaws are opened in centric relation. It will be noted that the ridges (but not the jaws) are also opened but simultaneously brought into a retruded relation.

Figures 5 and 6 show that we have to be very careful in specifying a ridge relation, for, by a mere change of the opening relation of the jaws without altering their centric relation, the ridge relations actually differ. This is of prime importance to the prosthetist, for he is confronted with the problem to determine, and finally to accept, a definite opening relation for a contemplated denture restoration. In his choice of an opening relation, he is

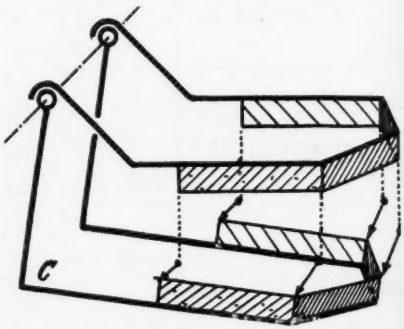

Fig. 6.—Association of jaws and ridges shown in Figure 4, but opened.

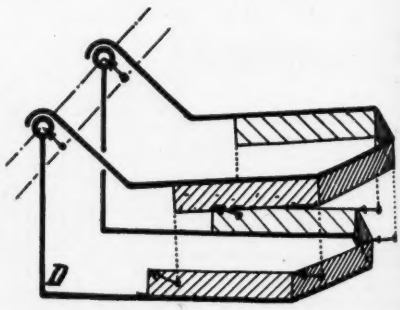

Fig. 7.—Centric relation of the jaws associated with a retruded relation of the lower ridge.

primarily governed by the requirements of function and esthetics.

Figure 7 shows an association of the jaws in centric relation, while the ridges are in retruded relation for an accepted opening. It will be seen from Figure 8 that these ridges can be brought into centric relation by bringing the jaws into a protruded relation.

Figure 9 shows the jaws in centric relation, yet the ridges are in left lateral relation. Again, we may bring the ridges into centric relation. This can be done only by establishing a right

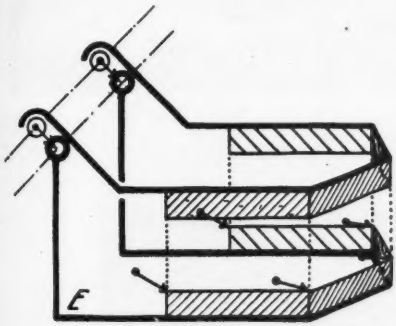

Fig. 8.—Condition illustrated in Figure 7, with the jaws brought into protruded relation, carrying the ridges into centric relation.

lateral jaw relation, as is shown in Figure 10.

A retruded position of the lower ridges for the jaws in centric relation frequently leads to misinterpretation. We were often tempted to protrude the mandible and associate such protruded jaw relation with the teeth in centric occlusion. The consequence was that, in natural closing, the jaws returned to centric relation, while the masticatory surfaces attempted to occlude in retrusive occlusion, for which balance usually was not established.

It is impractical to recommend a general procedure for specific cases of ridge relations. In each individual case our course is directed by esthetics, pho-

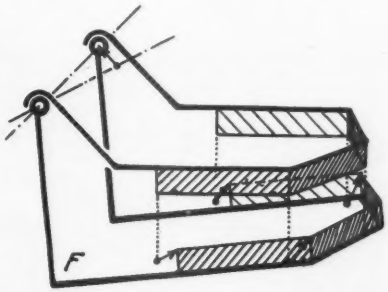

Fig. 9.—The jaws in centric relation associated with the ridges in left lateral relation.

netics and mechanical and physiologic function.

The requirements of esthetics have been amply expounded in our literature. In the end, their fulfilment remains a personal factor with the prosthetist. The consideration of phonetics as given

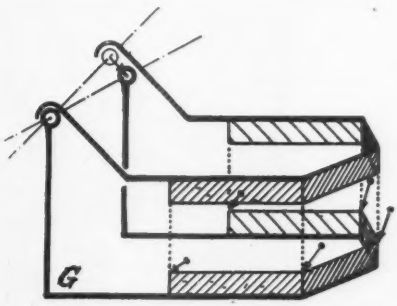

Fig. 10.—Condition illustrated in graph shown in Figure 4, but with the jaws brought into right lateral relation, carrying the ridges into centric relation.

by Dr. E. K. Peters, Fresno, Calif., and Dr. W. H. Wright, Pittsburgh, Pa., is recommended. The mechanical

requirements are expressed in the laws of articulation.

In our practice we are all confronted with cases presenting different characteristics, no two cases being identical. In order to bring out the relationship of occlusions and jaw relations and ridge relations, it was decided to select

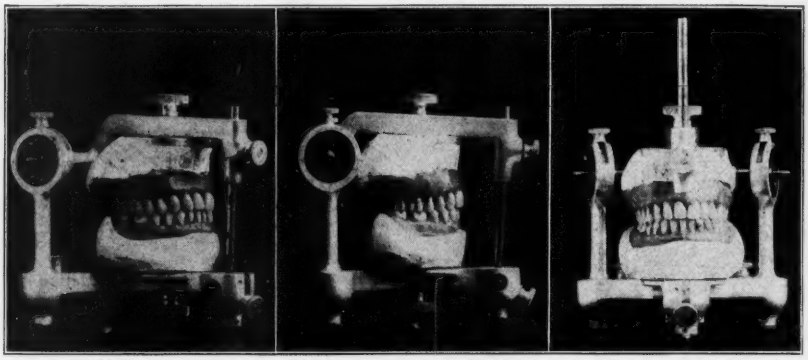

Fig. 11 (Case 1).—The accepted normal.

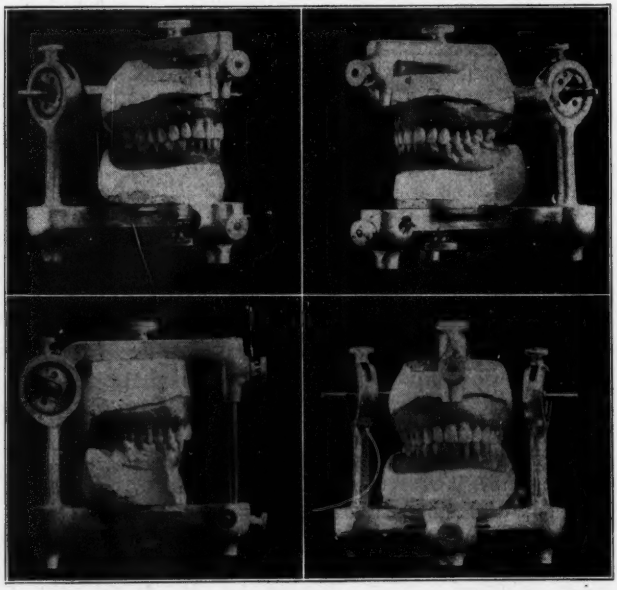

Fig. 12 (Case 2).—Retruded relation.

a suitable mandibular and maxillary ridge and mount the first case hypothetically in an accepted ideal ridge relation.

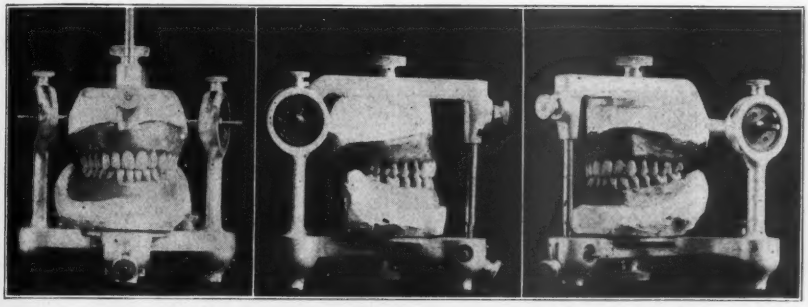

Fig. 13 (Case 3).—Protruded relation.

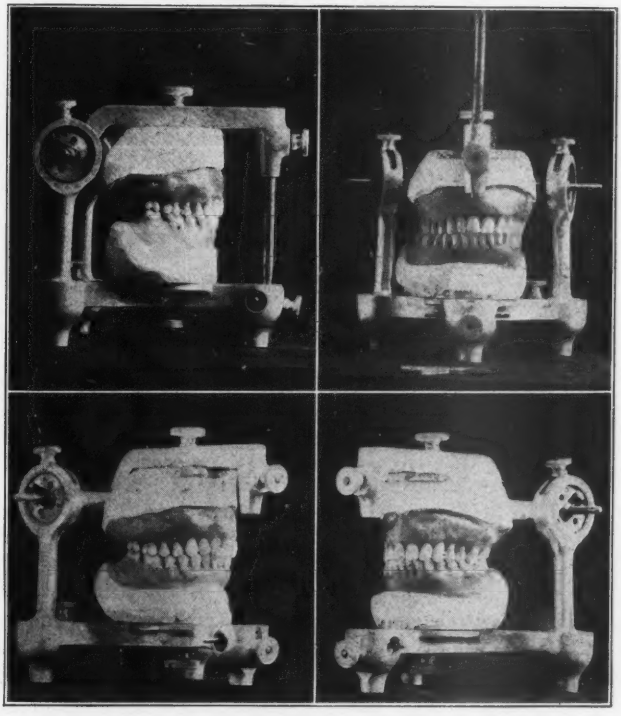

Fig. 14 (Case 4).—Lateral relation.

This case was diversified by retaining the mounting of the maxillary ridge and altering the position of the mandibular ridge as follows: Case 1 (Fig. 11). The accepted ideal relation. Case 2 (Fig. 12). The mandibular ridge mounted in retruded relation. Case 3 (Fig. 13). The mandibular ridge mounted in protruded relation. Case 4 (Fig. 14). The mandibular ridge mounted in lateral relation.

Cases 1, 2, 3 and 4 were carried through the articulator without change of its adjustments, and "trubite" teeth of the same mold were used.

The positions of the upper teeth were reproduced in all cases as closely as was consistent. Then the lower teeth were occluded to the upper, the main change in the set-up being a change of the tooth axes of both the upper and lower posteriors to conform as closely as possible to the lines between the ridges. Balanced articulation, of course, was reestablished in each case.

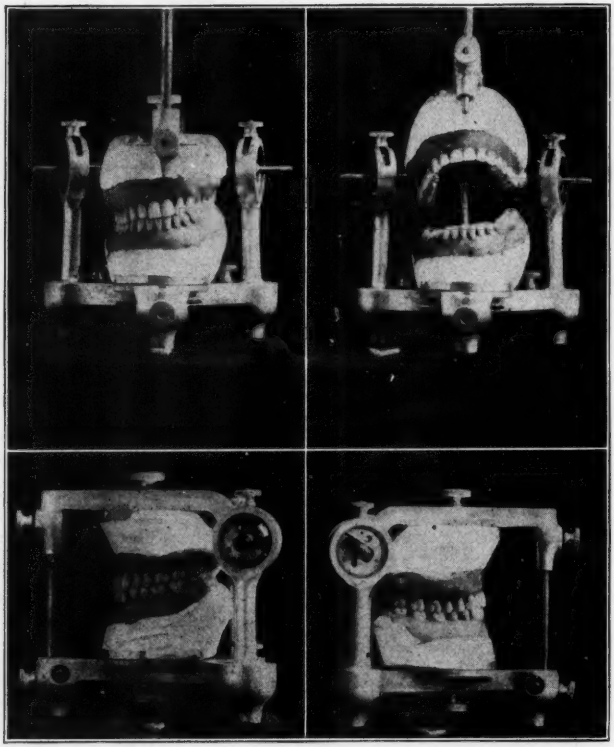

Fig. 15 (Case 5).—Hypothetical relation.

The occluding surfaces of the pos-

terior teeth of Case 4 were ground to accommodate the required change of direction of the tooth axes caused by the great lateral displacement of the mandibular ridge. The cusp height was decreased on the right side to permit a greater inclination of the tooth axes and all sulci on the left side were deepened to permit a more erect direction of the tooth axes.

Case 5 (Fig. 15) is a hypothetical case in every respect. A spirally alined ridge was accepted and the teeth were set up to occlude and articulate in conformity with the laws of occlusion and articulation.

The articulator adjustments in all cases were alike; namely, anterior-posterior condyle indication, 30 degrees, and lateral condyle indication, 15 degrees.

CONCLUSIONS

1. In all cases of denture construction, the masticatory surfaces of the mandibular and maxillary teeth have to be arranged or modified to conform to the laws of balanced occlusions, irrespective of the ridge relations.

2. Teeth should be set up so that their axes approach in position and direction an imaginary line between the ridges.

3. The influence of the ridge relations on the occlusal surfaces of our restorations becomes primarily evident in the cusp height and incisal overbite.

4. Exceptional jaw and ridge relations, as well as esthetic requirements, warrant modifications of conventional tooth alinements and molds, yet balance must be established in each and every case.

DISCUSSION

W. H. Wright, Pittsburgh, Pa.: Dr. Boyce's paper furnishes a substantial foundation for an understanding of occlusions, jaw relation and ridge relations. Differentiation between occlusion of the teeth and positional relationship of the jaws is absolutely necessary to a scientific discussion of this subject. "Unbalanced occlusion always is malocclusion for prosthetic dentures." Let us print this legend in large type and hang it where it is always before us. When the dentist learns this one rule, together with its practical application, he is on the highway to success with prosthetic restorations. The discrimination between occlusions with and without the application of force is of utmost importance; especially is this true when artificial dentures are involved. Since we are unable satisfactorily to measure or control forces applied to dentures, it is better to accept the absence of force as the starting point in denture restorations. I am in accord with the idea of balanced centric occlusion as given by Dr. Boyce. Greater intimacy of contact near the center of the restorations on either side enhances stability of dentures. In this manner, the effect of unequal tissue displacement under denture bases is compensated. This arrangement is the nearest possible approach to the ideal form of occlusal contact, from the standpoint of equilibrium. The necessity of associating analogous occlusions and relations becomes paramount when viewed with an understanding of this paper. The subject of occlusions and relations has been a difficult one for the dentist, owing to the great amount of uncertainty and mystery with which it has been surrounded. He will experience at first some difficulty in grasping the simplicity of Dr. Boyce's statements. This paper will go a long way toward dispelling error and misunderstanding, and should be recommended as study material for local societies and study clubs.

PORCELAIN AS APPLIED TO DENTISTRY*

By C. O. McBEAN, D.D.S., Los Angeles, California

THE porcelains used in the art of dental ceramics are definitely compounded, granular powders, which, in firing, are subject to several physical and chemical laws, a definite knowledge of which the ceramist must have in order to obtain the desired uniform results, in the restoration of lost tooth structure, from the standpoints of esthetics and strength.

The first of these laws that must receive our consideration is that of cleavage, or so-called fracture. The tensile strength of the dental porcelains is not sufficient to withstand the applied mechanical forces of mastication, unless they be properly supported.

The first consideration of the operator is a close study of the abrasion produced on the occlusal and incisal surfaces of the adjoining teeth, produced by these applied forces.

In preparation for a porcelain jacket crown, these surfaces should be reduced to a uniform thickness of not to exceed 1.5 mm., the natural markings of these surfaces of the tooth being maintained and thereby a seat produced for the porcelain at right angles to the line of force applied in the act of mastication.

At no time, especially on the six anterior teeth, should more than 1.5 mm. of the incisal surface be reduced, for, if a third of the incisal is reduced, it will be found, on study of the applied incising force, or that force applied to the porcelain in passing from the incising to the centric occlusion, that there is a bulk of porcelain entirely unsupported by tooth structure. Thus, the force is transmitted through this bulk of porcelain and is brought to bear on the thin veneer of porcelain, on the labial surface, which, as stated before, has not sufficient tensile strength, and cleavage will take place on the labial gingival third of the restoration.

The fracture will occur at the point of greatest curvature of the bell of the tooth.

A thin veneer of porcelain, suported at right angles to the line of force applied, has greater strength than a bulk of porcelain unsupported. If this were not true, there never would have been a fracture of a Davis or Logan crown. From clinical experience, we know that a thin veneer of porcelain properly supported will not fracture under these applied forces.

The axial surfaces of the stump should follow the general contour of these surfaces of the tooth except that the stump must be slightly conical in the direction of the occlusal or incisal, to permit of withdrawal of the stump impression without distortion.

The gingival seat, or shoulder,

*Read before the Los Angeles County Dental Association, May 18, 1926.

should be prepared just beneath the free margin of the gum, and should be but 0.5 to 0.75 mm. wide.

The stump thus prepared will still retain a thin veneer of enamel except on the two approximal surfaces, where a slight exposure of the dentin will take place. A stump prepared in this manner will subject the pulp to the least possible irritation. Furthermore, the removal of the cemento-enamel junction, in the preparation of the stump, in cases in which the gingival tissues are healthy and in normal position, will, in the majority of cases, produce an irritation of the peridental membrane, with subsequent pathologic change of these tissues.

The only exception to this procedure of preparing the gingival seat is made in cases in which disease of the gingival tissues has caused a recession of the tissues to a point at which the cemento-enamel junction is exposed to view. In these cases, for reasons of esthetics, the gingival seat should be prepared at the cemento-enamel junction, and no matter how far apically of the cemento-enamel junction the gingival tissues have receded, the gingival seat should never be prepared further apically than the cemento-enamel junction. An attempt to prepare the gingival seat in the root of the tooth will, because of the necessity of producing the conical shape to the stump, necessitate an encroachment on the horns of the pulp to the point of exposure.

The following technic is suggested for the preparation of the stump for a porcelain jacket crown, for example, an upper, central incisor.

With a carborundum knife edge disk, three quarters inch in diameter in the handpiece, with the engine revolving rapidly, a line is sighted from the incisal edge of the tooth toward the gingival, on the mesial side of the tooth, and a slice cut off from the mesial surface, with the cut ending just beneath the free margin of the gum, a shoulder approximately 0.75 mm. wide being produced thereby, just beneath the free margin of the gum, with the axial surface of the cut, inclining at an angle of 92 degrees toward the perpendicular plane of the long axis of the tooth. In a like manner, the distal surface is cut; then with an inverted cone mounted Miller stone No. 270, which is approximately 2 mm. in diameter, a line is cut into the enamel, about 0.5 mm. deep, just at the free margin of the gum, following the contour of the gum on the labial surface of the tooth, from the shoulder already cut, on the mesial surface, continuously to the shoulder cut on the distal surface.

With a Miller stone No. 228, which has a diameter of 2 mm. on the flat surface, and is 2 mm. wide on the cutting end, the enamel is reduced on an incline plane, on the labial gingival, third of the tooth, up to the shoulder, cut with the inverted cone stone. With the Miller stone No. 243, which is 2 mm. in diameter on the cutting edge, and about three-sixteenth inch on the plane surface, the middle and incisal thirds are reduced on the labial surface, following the general contour of the labial surface, but with the plane slightly inclining toward the incisal from the gingival, thus eliminating undercuts.

With a Miller stone No. 240½, (which is 0.5 mm. in diameter on the

cutting surface and 2 mm. in diameter on the plain surface), with the plain surface of the stone slightly abrading the surface of the tooth paralleling the long axis of the tooth, and with the cutting edge of the stone resting on and abrading the shoulder, the shoulder is reduced, and carried beneath the free margin of the gum, continuously from the shoulder, on one approximal surface, around the labial to the other approximal shoulder.

The above described procedure is now followed up on the lingual surface of the tooth, with the same numbers of the Miller stone, except that, on the lingual surface, the contra-angle is used. At all times, when the stones are abrading the tooth, a cool, steady blast of air should be directed on the stone and tooth, to prevent overheating, with a subsequent irritation to the pulp.

The differences in the serial numbers of the stones, for the straight handpiece, are the 200 serial, and for the contra-angle are the 300 serial.

The incisal end of the tooth is now reduced about 1.5 mm., with the plane inclined slightly to the lingual and at right angles to the line of force, from the act of biting.

With a sharp hoe chisel, the shoulder is planed smooth around the entire circumference of the tooth and the other surfaces of the stump are disked and polished.

The next step is the obtaining of a stump impression.

With a copper band one-half inch long and of 36 gage, trimmed and contoured to the festoon of the gum and fitting the gingival circumference of the stump approximately, the copper band is filled with black modeling compound which has been heated over the direct flame until very plastic. The band and compound are forced up on the stump, so that the band passes slightly beyond the shoulder. The compound is chilled, and the impression removed and examined, which will show under the magnifying glass that the compound has passed apically of the shoulder and because of the constriction of the root above the gingival seat, the withdrawal of the stump impression has caused a distortion of the compound at the gingival seat. With a sharp, fine lance, the excess compound is trimmed on a beveled plane from the periphery of the copper band back to the impression of the gingival seat, so that the circumference of the compound is greater at the periphery of the copper band than it is at the gingival seat.

The copper band and stump impression is returned and seated on the stump. Then, with a hot plastic instrument, the compound is heated slightly by placing the hot instrument on the lingual surface of the copper band, and then likewise on the labial side of the copper band. When the compound is sufficiently plastic to permit making an indentation in it with considerable pressure with the thumb nail, the finger is placed on the end of the copper band and steady pressure exerted, sufficiently to adapt the compound perfectly with the gingival seat, but without forcing the compound above the gingival seat, where it would adapt itself around the constricted portion of the root. Pressure is maintained with chilling until the compound is perfectly rigid. It will now be possible to remove the copper band and stump impression without distortion of the stump impression.

With the stump impression in place on the stump, a sectional compound impression of the adjoining teeth is taken. The sectional impression and stump impression are removed and a mush bite is taken in tenax wax.

An amalgam root is prepared by placing a ferrule of thin base plate wax around the copper band, and then investing it in plaster with the apical end of the wax up and exposed. Small pieces of very plastic amalgam are packed in the impression, continuing with amalgam which has had all the excess mercury removed, until the wax ferrule is completely filled. After a proper setting period, the root and copper band is removed from the investment of plaster, and the amalgam root shaped to the proper conical shape. The amalgam root and copper band are placed in a sectional compound impression and the impression assembled. Then the plaster or stone cast is poured.

After a proper setting period of the cast, the sectional impression and free stump impression and amalgam root are separated from the cast. The copper band is heated slightly and removed with the compound from the amalgam root. It will now be found that, because of the beveling of the compound below the gingival seat in the copper band, we have a root that has a greater diameter below the gingival seat than the diameter at the gingival seat. This is very desirable in order to prevent the platinum matrix from becoming locked on the root after the porcelain crown has been carved on it.

The opposing cast is poured in the wax bite, and both casts are assembled and articulated and then mounted on an anatomic articulator. After removal of the wax bite, the amalgam root is removed from the cast and the platinum matrix is burnished and adapted to the root. An overlap of 2 mm. of platinum matrix is left on the root above the gingival seat. The matrix, being perfectly adapted to the root, is annealed in the furnace at 2,200 F., in order to remove all spring from the metal, as well as to cleanse it thoroughly before applying the porcelain. Porcelain will not adhere to a greasy or dirty matrix.

The case is now ready for the application of the porcelain and carving of the porcelain for the crown.

The shades of porcelain necessary for the producing of the desired shade of the finished crown having been determined, the porcelain is built on the matrix covering the apron of the platinum matrix below the gingival seat, which, as stated before, is allowed to overlap on the root 2 mm.

The gingival third is built with the desired shade of porcelain, and then the middle third with the proper shade, and the incisal is built with the porcelain of the proper shade for the incisal.

The crown, having been built and carved to the proper anatomic form and occlusion, allowing for a shrinkage of one fifth in firing, is removed with the matrix from the amalgam root and the inside of the matrix is packed with a suitable high temperature investment, completely filling it, and the investment is allowed to incorporate the periphery of the overlap of platinum matrix. The invested matrix is mounted on a small pattie of investment and the excess moisture is extracted from the investment with dry investment powder, care being taken that no investment comes in contact with the porcelain. After a setting period of

five minutes, all the remaining moisture is dissipated from the investment by indirect heat not to exceed 200 F. The case is then ready for first firing.

The technic for firing is as follows, 2,440 degree or high fusing porcelain being employed:

TECHNIC FOR FIRING

Advance heat on No. 1 button to 1,600 F. Then advance a button at a time and at such intervals that, when 2,400 F. is reached, it is possible to control the rise in temperature and consume two and a half minutes in raising the temperature from 2,400 to 2,440 F. Then consume two and a half minutes from 2,440 to 2,400 F. Retard the remaining buttons on the rheostat with an interval of one fourth minute to each button, until the No. 1 button is reached.

When the temperature has decreased to 2,000 F. the crown may be removed from the furnace and allowed to cool to room temperature.

The porcelain thus fired will be completely fused, but will not have a glazed surface; rather, it will have the appearance of a so-called high biscuit.

Check the shade and contour and make correction by applying additional porcelain without removing the crown from the high temperature investment core.

The case can then be placed in the furnace at 1,600 F. and carried to 2,400 F., as on the first firing. Then consume two and a half minutes in raising the temperature to 2,440 F., and reducing to 2,400; thus, the time period, on the second firing, is just half that of the time period used on the first firing. The remaining buttons on the rheostat may be retarded as on the first firing, and remove the case at 2,000 F. and allow it to cool to room temperature.

Place the case under hot water and then, with a sharp lance, cut away that portion of the investment which incorporates the periphery of the matrix, and it will then be possible to remove the matrix and crown from the investment core. Any fine particles of investment still adhering to the inner surface of the matrix may be entirely removed with dilute hydrochloric acid, one-third chemically pure hydrochloric acid being used, to two thirds pure water.

Wash the crown thoroughly with clean water and place it on the amalgam root. With Miller stones, grind the excess porcelain from the overlap on the amalgam root below the gingival seat, using care not to tear the platinum matrix.

The contact points and occlusion may now be corrected by grinding the porcelain, and all the fine anatomic markings may be ground into the crown. Disk with cuttlefish disks, and then make a final check in the mouth for contacts and occlusion and contour.

Remove the crown from the stump and wash thoroughly in clean water, then place the crown back on the high temperature investment core used in the first and second firing, and dissipate all moisture by placing it on the apron of the furnace.

Place the case in the furnace at not to exceed 1,600 F., and then advance the temperature to 2,400, as in the first and the second firing, and raise the temperature to 2,420 F. without a time period, or in other words, as fast as the furnace will rise in temperature from 2,400 to 2,420 F. Then retard the buttons on the rheostat, hesitating on each button, until the No. 1 button is reached. Allow the temperature to decrease to 2,000 F., then open the knife switch and allow the temperature to decrease to 800 F., at which time the case may be removed from furnace and placed under the warm cover glass and allowed to cool to room temperature.

This slow decreasing of temperature on final firing prevents surface tension being placed on the porcelain.

In the manufacture of glass, the rapid lowering of the temperature produced by cool air being allowed to come in contact with the surface of the glass places the surface tension on the glass, this being due to a greater contraction of the molecules on the surface than of those in the center of the glass. It is well known that this surface tension makes glass friable and easily fractured. The surface tension also makes a smoother surface and thereby produces greater reflection of light rays. As it would be impossible to control uni-

formly the placing of surface tension on porcelain, our color and shading problems would be greatly complicated. Surface tension also makes porcelain more likely to fracture.

The platinum matrix is now removed and cementation made, varying the shades to approximate the shade of the case.

Let us now give a little consideration to the physical law of shrinkage to a common center which operates in the firing of porcelain.

If we take six granules and represent three as silica, which is the web of porcelain, and two as kaolin, which is the body, and the sixth one as feldspar or binder, and arrange the three silica and two kaolin in a circle around the feldspar granule, and with all in contact with the feldspar or central granule, and apply sufficient heat to start fusion of the central granule, the outside of the feldspar will start to go into solution first, and will, if the heat is removed, tack all the other granules together. This is what takes place in the so-called biscuit bake.

If heat is maintained for a sufficient length of time, the feldspar, or central granule, will completely fuse and will spread over the surfaces of the other five granules and draw them all to a common center, with each occupying one fifth of the space formerly occupied by the central granule. Thus, we establish the law of shrinkage to a common center.

Let us now observe a few of the common centers of a porcelain jacket crown.

We know that it is necessary to build an excess of porcelain on the incisal of the crown, because there will be a shrinkage toward the gingival, and we also know that if the porcelain is just built to the gingival shoulder of the platinum matrix, there will be shrinkage toward the incisal or away from the gingival shoulder. Therefore, there is a shrinkage to a common center approximately equidistant between the incisal and the gingival, the exact point being determined by the point of greatest bulk. Thus, it is necessary, after first firing, to reburnish the platinum matrix to the gingival shoulder on the amalgam root and then apply more porcelain to fill this gap.

If the physical law operates once, it must always operate. And again there is a shrinkage of this second application of porcelain from the gingival shoulder, but because of a lesser bulk, the shrinkage is not so great, and on the attempt to burnish the matrix to the shoulder again, it is impossible to get the burnishing instrument completely in between the fired porcelain and the shoulder and iron the matrix perfectly smooth, and in adaption to the gingival shoulder of the amalgam root. Thus, after the application of more porcelain at this portion of the crown and firing of the crown, we find, on removing the platinum matrix, that, instead of having a smooth, uniform square shoulder to the crown, there is a series of small irregular steps, which prevents a perfect adaption of the crown to the gingival seat of the tooth.

If there is one place that a jacket crown should fit perfectly, it is at the gingival seat, in order to prevent irritation to the gingival tissues.

If, on the other hand, porcelain is laid on the overlap of platinum matrix

below the gingival seat and the matrix is perfectly clean, as it should be, the porcelain, in firing, will attach itself to the matrix and carry it along as it shrinks to the common center, equidistant from gingival to incisal. Therefore, a crown constructed in this manner is less likely to fit at the gingival than one constructed by the first technic.

For the above stated reasons, it is absolutely necessary to have a suitable investment that will grip the periphery of the matrix and prevent the porcelain from distorting it.

Let us now consider another set of common centers on a porcelain jacket crown. We know that it is necessary to build an excess of porcelain at the contact points, for there will be a shrinkage toward the platinum matrix and, as stated, this is a shrinkage to a common center. Therefore, there is also a shrinkage away from the platinum matrix, as well as a shrinkage from the other two diameters of the circle. Thus, the shrinkage toward the matrix is offset by the shrinkage away; but the other two, or lateral, diameters are shrinking continuously around the entire circumference of the crown. Thus, the circumference of the mass is reduced, and the only thing to resist this shrinkage, or reduction of circumference of the mass, is the platinum matrix, which, in all but very small crowns, has not the strength to resist the shrinkage of the mass, with the result that the matrix buckles at some point, to the extent that, on completion and seating of the crown on the root, there is a space between the shoulder of the crown and the gingival seat of the tooth, caused by the crown binding on the stump at the point at which the platinum matrix yielded.

This also is the reason for advocating the use of an investment which, when packed inside of the platinum matrix, will prevent any distortion of the matrix.

Dental porcelains are compounds of silica kaolin, feldspar and the pigment, which is the oxid of one or more metals, and are scientifically prepared by the manufacturers, so that when received by the ceramist they are granular powders. It therefore devolves on the ceramist to evolve a method of packing or condensing the porcelain powder with each grain in its closest relation to its opposing neighbors, this being absolutely necessary in order to eliminate voids or bubbles in the porcelain on fusing, as a result of entrapped air. These small air bubbles in the porcelain produce an undesired change in the color of the porcelain, as well as weakening the porcelain.

This condensing of the porcelain powder is also necessary in order to reduce the shrinkage to the minimum. There are several such methods in use today. One is the burnishing method, which is accomplished by applying moist porcelain powder to the platinum matrix and then with a smooth, flat instrument attempting to burnish the granules of porcelain into a close relationship to each other. There is also the method which would be termed an attempt to beat the porcelain granules into their closest relationship to each other, the technic consisting of molding moist porcelain with the fingers on the platinum matrix, a procedure which incorporates a small percentage of sodium chlorid into the porcelain from the fingers; and, as sodium lowers the fus-

ing point of porcelain, the natural consequence is that the ceramist has no knowledge as to what the temperature at which the porcelain thus treated will fuse. After the porcelain is thus applied, a camel's hair brush, with hairs from an inch and a quarter to an inch and a half long, is used to beat the porcelain, with a consequent drawing of the excess moisture to the surface. The effect of this beating process on the granules of porcelain will be described in connection with the following technic for the packing of porcelain, the method of attempting to throw the granules of porcelain into their closest relation to each other by vibrating the moist porcelain.

If we take porcelain powder and add water until the powder becomes very plastic, owing to the complete lubrication of each granule by the water, and then apply this portion to a smooth, flat surface of a glass slab and vibrate it, we find that the porcelain flattens out and flows, following the same principal as water. Thus, it can readily be seen that the granules are forced apart from each other rather than thrown together. If, on the other hand, wet porcelain is placed in a small medicine dish and allowed to stand for a period of half an hour, we find that the porcelain powder which has a greater specific gravity than water, settles to the bottom of the dish, and, being supported from all sides by the walls of the dish, the granules of porcelain squeeze and force the water to the top.

On account of the lubricating effect of the water, the flat surfaces of the granules arrange themselves in opposition to each other, thus producing the closest possible arrangement to each other. If we now take a rough or cerated instrument and, by drawing it over the bottom of the medicine dish, produce vibration, we find that the water that is lying on top of the dense packed porcelain powder reenters the powder, and the mass has the same appearance as that which we placed in the dish to start with, this proving that the vibration of wet or moist porcelain throws the granules farther apart rather than drawing them closer together.

For this reason, the burnishing process, or the beating process, and also the vibrating process, distort the mass and drive the granules farther apart. Let us now take, in preference, very wet sand, because the granules are large enough to be closely observed, and place it on a glass slab, which is vibrated, allowing the granules of sand to separate as far as they will from each other. Now, with a loose fiber blotter applied to one end of the mass, the excess water is extracted. On so doing, we find that the granules of sand follow the water until they come in contact with the granules just preceding them. This physical process continues on throughout the mass, until all the excess water has been removed; whereupon, the granules are in their closest possible relation to each other.

This same physical action may be observed in Nature. At the seashore, we notice the water washing on the beach, thus lubricating the granules of sand, then receding and drawing the granules into their closest relationship, thereby packing the sand dense and hard. Now, if we observe the sand a little farther back from the water's edge, we notice that it is just moist. Were we to roll this sand with a heavy cement roller and then examine it, we would find the granules distorted and

drawn apart, proof of which could be applied by pouring a pail of water on the sand which has been rolled, and then permitting the water to sink into the sand and disappear. We would notice a decided depression where the water was applied, showing that the granules of sand were not packed by the roller. This can well be compared to the procedure of attempting to pack porcelain by the burnishing method.

From observing the physical action of water on granular substances, when the excess water is removed by blotting, I am firmly convinced that there is no more scientific method than that which is applied by Nature in the packing of granular substances: the physical laws of capillary attraction or the physical law of gravitation, as was described in regard to the wet porcelain in the dappin dish. The porcelain powder, having a greater specific gravity than water, and the mass being supported by four walls, the porcelain would settle to the bottom in its densest relation, with the water lying upon top; but as it would be necessary in using this physical law in the building of a porcelain jacket to make a ferrule of paper or some other substance to support the porcelain with four walls, I prefer to avail myself of the law of capillary attraction.

Applying this principle to the packing of porcelain, we add enough water to the poreclain powder to make it completely lubricated. Then, with a No. 0 Windsor and Newton sable hairbrush, which has hairs about one-fourth inch long, this wet porcelain powder is applied to the platinum matrix in a thin veneer around the overlap of the matrix on the amalgam root, and then, with dry porcelain powder, the excess moisture is extracted, or blotted out, by just touching the tip of one side of the veneer of wet porcelain to the dry porcelain.

After the excess moisture has been extracted, the dry powder used as a blotter is flaked off with a No. 1 Windsor and Newton sable hairbrush, which has hairs about one-half inch long. Then another application of wet porcelain is laid on one side of the veneer which was first applied to the platinum matrix, this procedure being followed by the same blotting process, but from the opposite side from that on which the last application was applied.

This procedure is continued until the crown is entirely built with the various shades of porcelain, as described before. The procedure of always blotting the excess moisture from the opposite side to that on which the porcelain has just been applied is the factor which draws the granules toward the matrix and into their closest relation to each other.

If the proper moisture is maintained in the porcelain built on the matrix, it is a very simple and quick procedure to build the crown to the desired form.

If too much moisture has been extracted and the porcelain which is being applied does not properly unite with that which is already built on the matrix, sufficient moisture should be added by building a small ball of porcelain on the already applied porcelain and then, with water carried to the little knob with a sable brush, the water should be allowed to pass into the porcelain and bring the moisture content to the desired point, to permit proper union of further applications of wet porcelain.

As stated before, the composition of

porcelain body is feldspar, kaolin, silica and the oxid of one of the metals.

Let us note some of the peculiarities of silica, the chemical equation of which is SiO_2 or silicon oxid, which has a great affinity for oxygen. Silica as found in Nature is a crystal formation of the trapezohedral class of the hexagonal system. Pure quartz, or silica, exists in two modifications, known as A-quartz and B-quartz. A-quartz is formed at temperatures below 575 C and is hexagonal, trapezohedral and tetartohedral, or, in other words, the crystal has six faces bounded by twenty-four trapeziums, and lacking in one quarter of the faces necessary for symmetry.

B-quartz forms at a temperature ranging from 575 to 800 C. and is hexagonal, trapezohedral and hemihedral, a crystal with six faces, bounded by twenty-four trapeziums, and lacking one-half of the faces necessary for symmetry; while at temperatures above 800 C., tridymite is formed, with crystals which are pseudo-hexagonal. Tridymite, when heated to 1,470 C., passes over into crestobalite, the crystal formation being octohedral, pseudo-isometric, a crystal with eight faces, with three axes of equal length and at right angles to each other.

From experiments which I have carried out on pure silica, with the reducing flame at temperatures between 2,800 F. and 4,100 F., there are changes which take place that point to another inversion in the crystal formation, as well as a liberation of a small percentage of oxygen, which produces a number of small bubbles in the bead of liquid silica. By holding the liquid silica at 4,100 F. for about ten minutes, the entrapped globules of gas gradually work to the surface, and free themselves, leaving a clear transparent bead of silica.

Silica shows an inversion of the crystal formation and a change in the crystal angles, at the following temperatures: 575 C., 800 C. and 1,470 C.

By comparing A-quartz with the bead of silica which has been reduced by the 4,100 F. temperature, we note that A-quartz is slightly opaque and creamy in color, while the silica bead is transparent and clear, which demonstrates that there has been a decided change in the action exerted by the crystals as they are inverted from one crystal formation to another on light rays, this action being a decided lowering of the refraction indices and bi-refringence.

Let us now consider feldspar, the chemical equation of which is $KAlSi_3O_8$—potassium aluminum silicate, or potassium sodium, aluminum silicate (KNa) $AlSi_3O_8$, which is formed in Nature by the contact, under very high pressure, of the oxids of sodium and potassium, and aluminum with silica. The silica, expressing its great affinity for oxygen, enters into a chemical rearrangement of the atoms, forming potassium or sodium—aluminum-silicate ($KAlSi_3O_8$) or ($NaAlSi_3O_8$).

Feldspar is of the monoclinic system of crystal formation, or those forms which have three unequal axes, with one axial inclination oblique.

Feldspar also is, at times, of the triclinic system, the type of crystal which has three unequal axes, with all of their intersections oblique.

The fusing point of pure silica is 3,500 F., while the fusing point of feldspar is from 200 to 2,400 F., and

is governed entirely by the percentage of sodium and potassium present in feldspar.

Let us take aluminum oxid (Al_2O_3) and fuse it with silicon oxid (SiO_2).

As just stated, silicon oxid fuses at 3,500 F., while aluminum oxid fuses at about 1,292 F. This being the case, we find that the aluminum oxid reduces the fusing point of the silicon oxid, while the silicon oxid raises the fusing point of the aluminum oxid, which is exactly the action which we know takes place in the alloying of two metals, namely, the lower fusing metal, reducing the fusing point of the higher, and the higher fusing metal, raising the fusing point of the lower.

To this aluminum silicate, a small percentage of potassium or sodium is added, or both potassium and sodium, which have fusing points of 144 F. and 207 F., respectively, and we find that the fusing point of the aluminum silicate is materially reduced—this being governed entirely by the percentage of potassium and sodium.

If feldspar, which has a very small percentage of sodium and potassium, such as the feldspar of S. S. White's 2,440 F. porcelain, is held at a temperature of 2,000 F. for a period of six hours, we find a fusion of the same takes place because of (1) heat accumulation, (2) heat; being merely an expression of exertion, force or pressure; and we also find that the reducing of any element, or substance to a liquid, is the applying of force or pressure from heat great enough to overcome the natural attractive force of the atoms, thereby increasing the radii of the atoms, one from another, to the extent that they are permitted to move in a free and undisturbed manner up to a certain point, thus giving the solid the appearance which is called fluid. But if the force or pressure of heat is continued beyond this definite point, the fluid becomes volatile and passes off as gases. Therefore, sodium and potassium, which fuse at such low temperatures, but still do not volatilize when in the chemical combination, as expressed for feldspar ($KNaAlSi_3O_8$), demonstrate that the atoms of the aluminum silicate exert a stabilizing effect on the atoms of sodium and potassium.

The immediate fusing point of feldspar, such as used in a 2,440 F. porcelain, is 2,400 F. If carried to a temperature of 2,560 F., the strain on the atoms of potassium and sodium becomes so great that they become volatile and form many small globules of entrapped gasses.

Kaolin, also a silicate, is a hydrous silicate, as shown in the chemical equation $H_4Al_2Si_2O4$ or $2H_2OAl_2O_32SiO_2$ or two atoms of water and one atom of aluminum oxid with two atoms of silicon oxid, and is produced in Nature by the weathering or decomposition of feldspar.

This decomposition is brought about by acid water washing out the potassium or sodium, and leaving water deposited in the feldspar.

There are other kinds of kaolin that are the result of decomposition of other of the aluminum minerals, but as these are mixed with iron-oxid, and more or less free quartz, which makes them unfit for use in dental ceramics, more will not be said of these impure types of ingredients of dental porcelains.

Kaolin is of the monoclinic system, and occurs as romboidal or hexagonal

scales or plates, which is earthlike when pulverized.

Pure kaolin, which is light brown, when heated with the blow pipe yields water, while, at 2,560 F., the color changes to a light gray, fusion taking place at 2,640 F.

If carried to a temperature between 3,500 F. and 4,100 F., a small percentage of oxygen is liberated, and small globules of entrapped gas form in the bead, and the color of the bead again changes from light gray to a clear, transparent amber, thereby showing a change in the crystal angles at the following temperatures: 2,560 F. and 3,500 F.

Kaolin, when mixed with water, is very sticky, as is adobe. It is this characteristic of kaolin which acts as a cementum substance in the wet porcelain powder, when the ceramist is building and carving a porcelain jacket crown.

The pigaments, which are the oxids of several of the metals, impart the so-called color to the different shades of porcelain by their physical action on light rays.

At this time, let us give a little consideration to light rays, which in reality are force waves, and have no real color, the color being merely an interpretation of the effect produced on the optic nerve, by the vibrations of certain force waves, which have wave lengths of, for red rays, 0.0007604 mm., and to those whose length constantly diminishes without break, through the orange, yellow, green and blue, to the violet, whose minimum length is approximately one-half that of the red or 0.0003968 mm. It is the vibration of all the rays together in a beam of light which, when received on the retina of the eye, gives the sensation that is interpreted as white light.

There are other waves, such as sound waves, heat waves, and also the hertzian waves, used in wireless, which have a greater wave length than the red, but do not produce a sensible impression on the retina of the eye. The same is true of those waves that have a shorter wave length than the violet, such as the ultraviolet, roentgen ray and the rays which emanate from radium, but all of these answer to the same laws and phenomena, which govern all of the rays successively through the spectrum, or from the red to the violet.

When light waves of a given length are combined with light waves of another length, or a so-called complimentary color, the sensation of a different color is produced.

All of the rays of the spectrum have their complimentary color, as, for example, blue, when combined with yellow, produces green. Therefore, from the foregoing phenomena, it is obvious that the color of an object is the interpretation of the vibration of light waves received from that object and as it is white light which came in contact with the object, it must follow that certain ones of the rays have been absorbed in the object, and those which are received on the retina of the eye are of such a combination of wave lengths as to produce the color of the object.

This brings us to the laws that govern the different phenomena of light, when it comes in contact with various substances, and as it would require an entire paper to do justice to this subject, only a few of the primary laws will be described.

First, light waves that come from a far distant luminous object apparently

travel in a straight line, but, at the source of the impulse, are sent out in circles, increasing in circumference as the distance increases from the source, so that, at a great distance, they appear to travel in a straight line.

The wave, as it travels through the ether, comes in contact with ether particles, which are forced transversely to the direction of the wave, and oscillate up and down, communicating the impulse to the next ether particles and thus producing the wave motion, which continues until the force of the original impulse has been dissipated. As the light waves come to the boundary of one medium from another, they are, in part, reflected or returned back to the first medium. These are referred to as reflected rays, and the percentage of rays reflected is governed by the smoothness of the surface of the second medium. The angle from the perpendicular at which the rays come in contact with the surface of the second medium is called the angle of incidence, and the angle of reflection is always equal to the angle of incidence.

When white light rays pass from one medium into another, an increase or decrease of the velocity of the ray occurs, as, for example, when rays pass into a denser medium, the velocity of the ray is lessened, with a subsequent bending of the ray toward the perpendicular. This phenomenon is partially due to the following laws: when plain light waves come to the angle of the surface of a prism or crystal, they are bent, the degree being governed by the velocity of the light ray, plus the axis of the crystal, and the mathematical angles of the crystal. Therefore, if the velocity of the ray, in passing through the medium, has been lessened, and the angle of refraction is great enough to so bend the ray that it does not reappear at the surface of the medium, these rays are absorbed. The color of the medium will be governed by the wave length of the rays which are not absorbed, combined with the rays of reflection.

This is the phenomenon which occurs when light enters the various metals, and is the governing factor as regards their color.

The pigments of porcelain, which, as stated before, are the oxids of different metals, thus so absorb light waves of certain wave lengths that the returned rays, plus the reflected rays, produce the various desired shades of porcelain.

With these laws in mind, it is easily understood why the different parts of the tooth vary in interpretation of shade as well as each tooth differing from its adjoining neighbor. If observed closely, the interpretation will vary at different times of the day. This is not due to faulty eyesight, but is the result of the operation of these scientific physical laws.

These laws are the factor which influences the different shades of the teeth under the varied conditions to which they are subjected, as, for example, an upper central incisor that is of a yellowish, creamy color when the lip is retracted, will shade to a gray or a bluish gray on the incisal tip, or that portion of the tooth which is exposed to view, when the lip is in rest position. The intensity of the graying of the incisal third, or tip of the tooth, will be determined by the thinness of that portion of the tooth, as well as the intensity of coloring of the lip, com-

bined with the effect produced by the dark oral cavity.

If a white napkin is placed back of this same tooth with the lip well elevated, it will be found that the gray, or bluish gray color will not be present in the tooth.

For these reasons, I find it advisable to take the shade of the gingival third, with the lip well retracted, and the incisal and middle thirds of the tooth covered with a piece of white card, then with the lip still retracted, and the middle and gingival thirds of the tooth covered, obtain the shade of the incisal third. The middle third will generally be a blending of these two colors. For that portion of the incisal of the tooth which is exposed to view, with the lip in rest position, the color is determined with the lip in rest position.

As the patient spends but a small percentage of the time in bright day light, it seems also advisable to chart the shades of the tooth under artificial and subdued light, and then produce a shading of the restoration which will harmonize under all these conditions.

There is one point in shading that I wish to emphasize; The labial surface of an upper central incisor, presents on close inspection, grooves, pits and ridges, as well as many fine markings, which produce facets. These break up the high lights, by reflecting part of the light at such an angle that the rays are not received by the eye. At these points, there will be an appearance of graying of the tooth. This effect may be produced in the porcelain restoration, either by carving these markings, or by grinding them in the porcelain, before giving them the glaze firing.

At the first firing of the porcelain jacket, I find it advisable to make a small veneer of the shades of porcelain being used in the building of the crown, and fire it at the time of firing the jacket. It is then possible to strip the platinum from this veneer and test the shade without the influence of the platinum upon the color.

From the foregoing physical and chemical laws, it can readily be seen that a uniformity of results can only be obtained when the technic used gives due consideration to these laws.

PORCELAIN INLAYS

The following technic is suggested for porcelain inlays. The principles of cavity preparation are as follows:

No cavosurface bevel should be placed upon the cavity, for the porcelain inlay must have no frail or overhanging margins.

The cavity should be box-form as nearly as possible, with the bevel of the walls extending to the seat of the cavity, as in the preparation of a cavity for amalgam.

The final finishing of the margins of the cavity preparation should be done wherever possible, with suitable stones.

The obtaining of an impression of the various types of cavities is as follows:

IMPRESSION TECHNIC

For a simple cervical cavity, red-stick compound is molded into a small cone; the base of the cone is chilled to the extent that the base is comparatively rigid, and the apex of the cone is heated over the direct flame.

Saliva is allowed to lubricate the cavity, then the apex of the cone is placed in contact with the floor of the cavity, and with pressure on the base of the cone, the compound is spread out over the floor of the cavity, against the walls and over the margins of the cavity. Steady pressure is maintained on the base of the cone, and the compound is chilled until it is perfectly rigid, at which time, the impression may be withdrawn from cavity.

The impression is examined with a magnifying glass, and if every detail of the cavity is reproduced in the impression, the latter is prepared for packing of an amalgam die, as will be described later.

For an approximal cavity, if possible, cavity should be prepared so as to permit withdrawal of the impression from the lingual side.

After the teeth are separated, a piece of steel matrix is placed between the two teeth, and then, with a cone of compound, treated as described before, the apex of the cone is placed in the cavity, and forced over the floor of the cavity, causing it to mushroom out to the walls of the cavity, and pass over the labial margin about 0.5 mm. Steady pressure is then maintained on the base of the cone, and the steel matrix is gripped and bent well over the labial surface of the tooth, the compound being thereby forced into perfect adaptation with all of the margins of the cavity. Pressure is maintained, and the compound is chilled until it is perfectly rigid, at which time, the steel matrix is withdrawn. It will then be very easy to withdraw the impression.

The impression is prepared for packing the amalgam die, after being examined under the magnifying glass, as to the perfection of the impression.

For a compound cavity, such as a mesial-incisal, after proper preparation of the cavity, a copper band is trimmed which fits the greatest circumference of the tooth, so that the copper band may be seated against the contact on the opposite side of the tooth from the side which holds the cavity, and the periphery of the band is permitted to extend well up above the gingival seat of the cavity, as well as all the other margins of the cavity.

The patient now lubricates the cavity with saliva, and the copper band is filled with compound, and heated over direct heat, until comparatively plastic. The copper band and compound are carried over the tooth, and are forced to place, the margins of the copper band and compound extending well over the margins of the cavity. Steady pressure is maintained, and the compound is chilled until perfectly rigid, when the copper band and compound are withdrawn.

The impression is examined to make sure that it is perfect, and preparation is made for packing of amalgam die.

The preparation of all three types of impressions for the packing of the amalgam die is the same, except that, for the impression of the approximal cavity, the compound overlap of the labial margin is only 0.5 mm. A snow white plaster is mixed and made into a small pattie, one eighth inch thick, and about one half inch in diameter, and the approximal impression is gently drawn onto the surface of the plaster pattie, with the part of the compound that was in contact with the steel matrix, in contact with the plaster. Thus, the plaster will produce a continuation of the labial surface of the impression of the tooth, beyond that obtained with the 0.5 mm. overlap of compound at the labial margin.

After the setting period, a ferrule of thin base plate wax is placed around each impression, and the impression is invested in plaster, the plaster being permitted to support completely the base of the compound, as well as the wax ferrule.

After the setting period, the impression is packed with amalgam, the operator starting with very plastic amalgam, and jarring the amalgam into perfect contact with the cavity impression. Packing with amalgam which has had all excess mercury removed is continued until the wax ferrule is completely filled.

After the setting period of the amalgam die, the plaster and compound are removed from the die, and a platinum matrix is adapted to the cavity surface of the die by burnishing and swaging with a water swager.

The overlap of the platinum matrix beyond the margins of the die should be at least 2 mm. wide.

Before swaging in the water swager, the die, with matrix seated in it, is tied in a piece of rubber dam, in order to maintain the matrix in proper position in the die during swaging.

After swaging, and with die and matrix still tied in the rubber dam, all surfaces and margins of the matrix are reburnished in order to remove any slight creases that have appeared in the platinum matrix.

All tension on the platinum matrix is removed by annealing in the electric furnace at 2,000 F.; then the matrix is replaced in amalgam die, and the die and matrix are tied in rubber dam, and reswaged. After final swaging, the rubber dam is removed and in-

lay wax is allowed to flow into the cavity of the matrix and over the margins of the cavity. The matrix is removed from the die, and invested in high temperature investment, permitted to incorporate the periphery of the matrix. Excess moisture is removed from the investment with dry investment powder, with a setting period of five minutes, then the investment powder which was used as a blotter is removed and all remaining moisture dissipated with indirect heat, not to exceed 200 F. The inlay wax will soften sufficiently to permit of its removal from the platinum matrix, by the insertion of the point of an explorer in the wax, and withdrawal of the wax from the matrix.

The case is placed in the furnace, whose temperature is carried to 2,000 F. The case is then removed from the furnace, and, after cooling to room temperature, the application of the desired shades of porcelain to the matrix may be made.

As it is almost impossible to prevent a small tear occurring in the floor of the matrix, we again avail ourselves of the law of capillary attraction in the condensation of the porcelain in the platinum matrix, by the action of the dry investment, extracting the moisture from the under side of the matrix, and thereby drawing the porcelain toward the matrix with the grains in their closest relation to each other.

On the first application of the porcelain to the matrix, the porcelain is built to the cavity margins, and the first firing, after dissipation of all moisture, is given to the porcelain, with the technic described for the first firing of porcelain jacket crowns.

The second application of porcelain, after the case has cooled to room temperature, is made in following manner.

The wet porcelain is carried and laid with the No. 0 Windsor and Newton brush, on the porcelain already fired in the matrix. After completely contouring the inlay the excess moisture is extracted by dipping the wet brush into dry porcelain powder. This will hold enough of the dry porcelain powder on the brush to act as a blotter, when the brush is touched to one side of the porcelain laid on the matrix. Application of the wet porcelain and extraction of the excess moisture is continued, until the porcelain is built well over the margins of the cavity. The case is then ready for the second firing.

The case, having been removed from furnace and allowed to cool to room temperature, is placed under hot water, and, with a sharp lance, the investment is cut away from the periphery of the matrix, and the matrix and inlay are removed from the investment. Any small particles still adhering to the under side of the matrix may be removed with dilute hydrochloric acid, as described for the porcelain jacket crown. The matrix and inlay are washed thoroughly with clean water, and seated in the amalgam die.

With suitable stones, the excess porcelain, which was built over the margins, is ground off and the inlay is properly contoured. It is then disked with cuttle fish disks, and thoroughly washed in clean water.

The matrix and inlay are removed from the die and reinvested in a high temperature investment, all moisture being dissipated as on first investing, and are fired for glaze firing as described for porcelain jacket crowns. Cementation is then made with proper shade of cement.

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Editorial

1927

The coming year promises much for progress in our profession. It will be an active year in the American Dental Association. The President, Dr. Banzhaf, with his splendid committeemen and chairmen of sections, is preparing a program that insures a successful meeting at Detroit.

With the mass of material of the Seventh International Dental Congress largely before the profession by that time, it will be possible for our essayists to evaluate the actual progress made at that great gathering, and to determine how much of it may be recorded as permanent literature.

In this issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, we begin the publication of the Congress proceedings, and these will be pushed with all possible vigor till the entire series of papers are completed. To further this end, our Business Manager, Dr. King, has granted thirty-two extra pages for each issue, and, with this additional space, we may confidently hope to place before our readers such a volume and variety of material

that they will be more than ordinarily entertained. It will be the policy to curtail all the other departments of THE JOURNAL as much as possible to make room for the Congress proceedings, and, in this way, the profession will have before it the entire transactions at the earliest possible moment.

This does not mean that it is our intent to ignore other pertinent and timely material as it comes to us, but that the pledge given our members that they should have prompt access to the Congress proceedings makes it incumbent on us to get this material before them with the greatest expedition.

THE SEASONS—WINTER

Most people affect not to like winter. That is because they have never learned to understand it. There are just as many glories in winter as in other seasons of the year, only they must be sought a little more assiduously. It is a sterner season than the others, a hardier season, and somewhat more exacting. It was not arranged for invalids or for the very aged—it is too boisterous in its moods. But for those who care to cope with Nature in her rugged whims, who love to go out and battle with the storm, and brave the wind, who love to pit their power against the warring elements, winter is a wondrous season.

The touch of frost on the cheek, the tingling sting of frigid air, the wierd, wild sweep of the north wind are all eloquent of winter. The first real fall of snow—what a mantle of beauty it is, covering up the roughened inequalities of the earth, and putting a fleecy blanket of purest white over hill and vale. What is more glorious? And the air after a snowfall—clear and crisp, and filled with tonic. The snow has washed it clean and left it filtered for the lungs of men. Surely the snow is an emblem of purity and cleanliness.

There is nothing more beautiful in Nature than the drapery of moist snow clinging to the branches and trunks of trees and shrubs, and hanging from the housetops after a quiet night. The sun never shown on a fairer scene. It cannot be described in

words or reproduced by an artist—it reigns supreme in fairy land. And when the ice-king comes, and coats the limbs with diadems of purest ray, and the sunshine sparkles and glistens and shoots the javelins of light with a myriad diamond sparks—how wondrous and full of miracle it is. Nothing but winter could produce a vision like this.

And when the snow storm rages, and the wild elements start an orgy that ends in a hurricane of white, what better fun than to get out in it and fight it? To battle with a boisterous snowstorm, to face the hardest wind that blows, to beat against the swirling blasts with each drifting flake stinging like a tiny bit of steel—this is a game worth getting into. And then to come out victorious, and plunging through the drifts to round the corner of the house and step up on the porch with a ringing tread, and shake off the clinging snow. Ah, this is sport! The breath comes with steaming puffs, the eye sparkles brightly, the cheek tingles with a ruddy glow, and the whole body vibrates with pulsing life. And when the door is opened, and we stamp our way in by the blazing hearth, and remove our wraps, with falling flecks of white that had drifted into the folds of our garments, we think of Whittier's poem!

> What matter how the night behaved?
> What matter how the north-wind raved?
> Blow high, blow low, not all its snow
> Could quench our hearthfire's ruddy glow.

Oh, the hearth-fires of winter! Not the steam coils of the city with no sign of life in them, but the stoves and the open fire places, with the blazing, snapping, crackling logs of wood, or the radiant bed of coals, sending warmth and light and cheer—the flames in the fireplace leaping and darting and warping themselves into the most grotesque forms and images, and the bright streaks through the cracks in the stove with the reddening sides throwing heat throughout the room. What is more cosy than this—what more comfortable?

And then after a tramp through the snow, from the kitchen the odor of the coming meal, and the clatter of knives and forks, and the chatter of the children, and the story, and the peal of

laughter, while the snow outside beats and swirls against the frosted window panes. Winter has its compensations, even though it may at times exact its penalties.

Lowell has said: "Take winter as you find him, and he turns out to be a thoroughly honest fellow with no nonsense in him, and tolerating none in you, which is a great comfort in the long run."

The snow is the best friend of the soil, covering it in a loving blanket and protecting the dormant rootlets from the too vigorous embrace of the frost. And even the frost has its function, tearing the dried and hardened soil apart and cultivating it for the crops to come. All these mysterious processes are beneficent.

And at night, to go out to the barn and feed and water the stock, to listen to the rattle of tethers and the whinneying and bawling of the hungry beasts, to hear them munching contentedly at the plentiful fodder, and see them wade knee deep in their warm straw beds, to snug each one up comfortably for the night, and then close the stable door with the assurance that every animal is satisfied and content—this tends to one's peace of mind. In winter, the bonds between man and beast become very close, the dependence of the one on the other creating a community of interest which lends zest to life.

Nothing is more glorious than a moonlight night in winter, with the lambent beams shedding a soft wierd sheen over the sleeping snow, with the deepened shade behind the buildings and the oblique shadows slanting out from trees and spires. And the tinkle of the sleighbells—is there anything more musical than this on a quiet winter night? One can always tell the gait of the horse by the beat of the bells—the short snappy peal of the smart stepper, and the slow rhythmic jog of the staid old steed, but all clear toned, harmonious and delightful. He who has ever sat and listened to the ringing cadence of the sleighbells in winter will never cease to be thrilled by the cherished memory of it.

And then the winter brings us Christmas—that blessed season of charity and good cheer—when the hearts of men expand and the hands of men reach out to clasp the hands of their fellow-

men, when loving-kindness reigns supreme, when the absent ones gather again around the family fireside, when peace and goodwill supplant the seeds of avarice and gain, when the sympathies of all the world are wakened, when harmony and happiness, and hope and joy, and the blessed balm of benevolence shed their benison abroad—this is Christmas. And Christmas comes in winter.

New Year, with its hopes and plans, its bright anticipation of better things, its fresh resolves, its lengthened vision, and its buoyant spirit—this is winter.

However chill the blast may blow, however high the tempest rage, however deep the snow may pile, there is something sublime about the grandeur of this great night time of Nature. It is the season of the home and the fireside, and the slumber of Mother Earth.

PROPOSED AMERICAN DENTAL HEALTH CENTER IN SEOUL, KOREA

At the meeting of the Board of Trustees of the American Dental Association in August, at Philadelphia, Dr. J. L. Boots, who has been five years in Korea as a dental missionary, proposed a plan for the dental profession of America to raise a fund for the erection of a building in Seoul, to be known as the American Dental Health Center, for dental treatment, teaching and research.

This work has already been carried on for ten years under mission boards cooperating for Christian education in Korea, with headquarters in New York. The dental department is directly controlled by Dr. Boots and Dr. J. A. McAnlis, their salaries being paid by those interested in the work, entirely outside any building or endowment fund, and their appointments are for life.

The opportunity for research is unequalled. There are 17,000,000 people with a limited fixed diet, containing no sugar and little fat soluble vitamin, and presenting certain typical dental pathologic conditions, and there is also a student group of several thousand who add to their old diet the sweets of the American and Japanese diets.

In his statement to the Trustees, Dr. Boots said:

Dependent on mission donations, we are always limited in our work, as these funds are provided mainly for evangelistic work. With a $100,000 endowment provided by individual dentists and state and local societies in the form of $10.00 shares, we can establish the most prominent dental unit in the mission world. We have a site, we have two American dentists who are willing to work there on a mission salary, already provided, we have the cooperation of every mission group in Korea including the Roman Catholics as well as the natives and the government. We ask for the endorsement of the American Dental Association of the proposed plan of raising the money and establishing this unit. We suggest the appointment of an A.D.A. Korea Clinic Advisory Committee.

The following resolution was passed:

The Board of Trustees recommends that the American Dental Association endorse Dr. Boots' proposed plan to establish an American Dental Clinic for the furtherance of public health and dental research in Seoul, Korea, and to appeal to dentists and dental societies in the United States for funds for this purpose. It is also recommended that the Association appoint an advisory committee of five members.

The following committee was appointed: H. E. Friesell, Pittsburgh, Pa.; M. H. Hoover, Gibson City, Ill.; L. E. Ford, Los Angeles, Calif.; W. J. Scheiffley, Harrisburg, Pa. (formerly dental missionary to Korea), and J. B. Davidson, Newark, N. J.

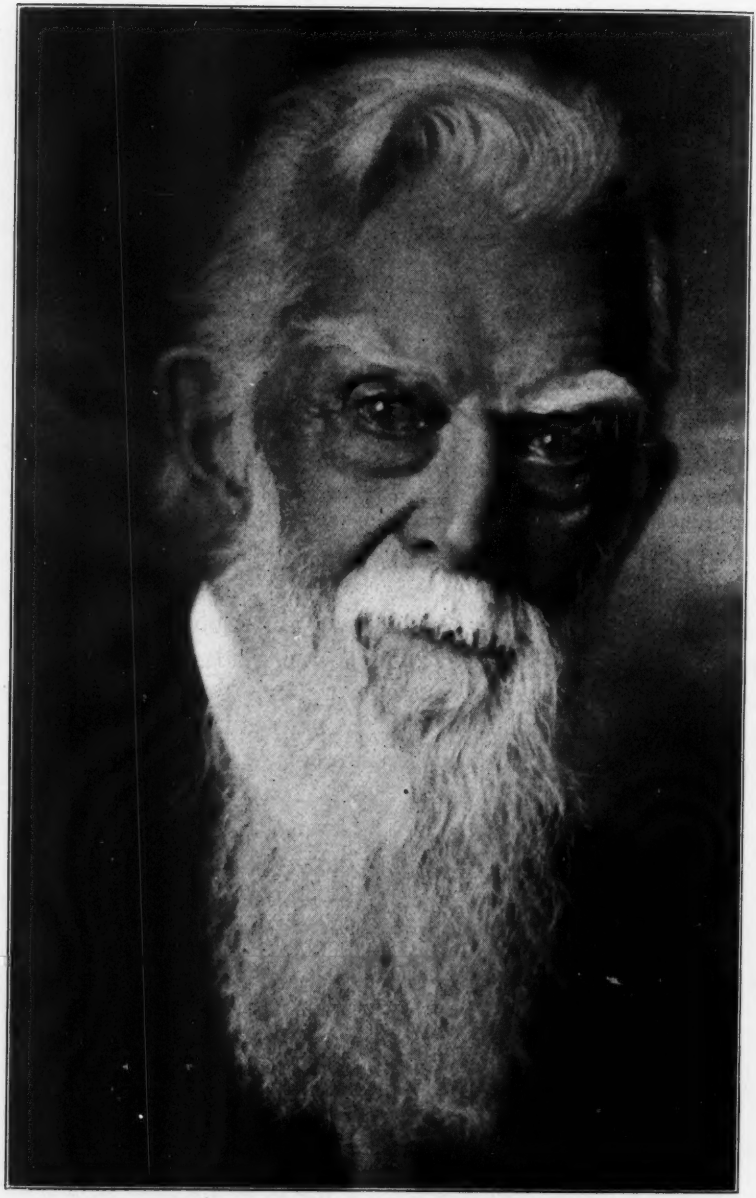
Further detailed information regarding this worthy movement may be had by writing the chairman of the Committee, Dr. H. E. Friesell, Schenley Apartments, Pittsburgh, Pa.

WILLIAM SMEDLEY, D.D.S.

The dental profession lost one of its outstanding western members and a familiar figure at the American Dental Association meetings in the death, from pneumonia, of Dr. William Smedley, the dean of the profession in Colorado, Oct. 28, 1926, at his home in Denver.

Dr. Smedley was born of Quaker lineage, in Chester County, Pennsylvania, May 4, 1836, and was therefore midway in his ninety-first year at the time of his death. Until a few years ago, he was in active practice and, almost until his death, carried on work incident to his profession.

During childhood, his health was poor, and so, with the primary purpose of regaining his health but also moved by the pioneering spirit, he "crossed the plains," in 1862, going from Omaha, Neb., to Salem, Ore., in a prairie schooner, drawn by oxen. After teaching school one year in the far West, he returned to the East by way of the Isthmus of Panama, and took up the study of dentistry, graduating from the Pennsylvania College of Dental Surgery in 1866.



WILLIAM SMEDLEY
1836-1926

In December, 1868, the State Dental Society of Pennsylvania was organized, with Dr. Smedley as one of the charter members. He practiced in West Chester, Pa., until 1870, when he again sought the healthful climate of the West. He arrived in Denver, Sept. 25, 1870, where he had since practiced his profession.

July 4, 1872, he was married to Miss Mary Ellen Vickers of Chester County, Pa. Five children were born to them. His sons, William P. and V. Clyde Smedley, together with his son-in-law, Max Giesecke, and George R. Warner and Clay W. Withers practiced with him as the Smedley Dental Group.

He helped organize and was the first president of both the Denver Dental Association and the Colorado State Dental Association, and he had been treasurer of the latter organization continuously since 1890, until last year, when he was made treasurer emeritus. He was a member of the American Dental Association.

Dr. Smedley always stood for the highest ethical principles and for the most advanced standards of the profession. Since coming to Denver, he has been a notable figure, and his activities have not been confined to his profession. He was president of the North Denver School Board for seventeen years. He had been an active member of the Colorado Humane Society for over thirty years and was its treasurer at the time of his death. He was one of the early members of the Denver Chamber of Commerce and, some years ago, was made an honorary life member. He was a member of the Denver Philosophical Society and a life member of the State Forestry Association. He was a member of the Colorado Mountain Club and climbed many of Colorado's highest peaks. He was an honorary member of the Psi Omega fraternity and belonged to Union Lodge No. 7, A. F. & A. M.; Denver Chapter No. 2, R. A. M.; Colorado Commandery No. 1, Knights Templar, and El Jebel Temple, Nobles of the Mystic Shrine.

In 1911, on the occasion of his seventy-fifth birthday, a testimonial banquet was tendered Dr. Smedley by the dentists of Denver, at which time he was presented with a gold watch. In 1916, at Manitou, another tribute of similar character was extended by the Colorado State Dental Association in honor of his eightieth birthday; and at the Shirley-Savoy Hotel in Denver in 1920, his completion of fifty years of practice in Colorado was honored by the Denver Dental Association and a loving cup bearing a commemorative inscription was given him.

At the June, 1926, meeting of the Colorado State Dental Association, in Colorado Springs, a banquet was given in his honor commemorating his ninety-first year, and each member's badge bore his photograph. He was on this occasion presented with an album made up of letters of personal tribute from nearly every member of the association.

In stature, 6 feet and 3 inches tall, as straight as an Indian, with a kindly countenance adorned with a long white beard, he made a striking appearance.

He was one of the most beloved of Colorado dentists. Probably few men have lived to such an age and kept so many friends.

Interment took place in Fairmount Cemetery, Denver.

DEPARTMENT OF DENTAL HEALTH EDUCATION

THE DEVELOPMENT OF MOUTH HYGIENE; WHAT DOES DENTAL CARE AT SCHOOL MEAN TO PUBLIC HEALTH?*

By ERNST JESSEN,† Basel, Switzerland

YOU wish to hear from me the answer to the question that has so often been answered and is, properly speaking, no longer a question, regarding the importance of community mouth hygiene; for the importance of public health has been recognized at last after a long campaign by the authorities, physicians, teachers and part of the laity.

That point had not been reached in Germany forty years ago, at the time when I had finished my studies and wanted to establish my practice at Strasbourg and to hold myself available for a university position.

People asked: "What does he wish to do here? We already have two dentists." You may know how difficult and necessary it was to build up a practice and afterwards to educate my clientele to such a degree that the greater number of my pupils would find there a demand for their services.

At present, dentistry is generally recognized there as a special branch of medicine, with the same rights as other branches at all the universities in Germany and is represented by professors with the title of *ordinarius*.

The first government institutions were founded in Berlin and Leipsic, with modest equipment, in 1884.

For many years, they had had magnificently furnished schools in America, which were authorized by the government to grant the D.D.S. degree.

In Germany, young candidates could only get that training under the tutelage of older dentists. If, at German universities, it was desired to train students as dentists, the parents had to furnish the means themselves, e. g., a laboratory and educational appliances.

This fact was perhaps unknown to you, gentlemen, and therefore it will perhaps be of interest to you to hear something about this struggle from someone who witnessed it from beginning to end. My task in Strasbourg was to popularize dentistry, to bring the importance of dental care to the knowledge of the public, to secure the acknowledgment of our activity by the authorities, physicians and the public.

The scientific side, the advancement of our profession, the acknowledgment by the faculties afterwards became the interest of my former pupil and later

*Read before the Section on Mouth Hygiene, Preventive Dentistry and Public Health at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 23, 1926.

†President of the H. C. F. D. I.

successor, Prof. Dr. Med. Römer, in Strasbourg, who is at present ordinary professor at Leipsic.

An increasing number of partisans for scientific dentistry were won at all universities, whose generally recognized leader was our never-to-be-forgotten Miller.

I shall tell briefly from personal experience how the historical development of the dental health movement in Strasbourg took place. In 1884, I was informed by the faculty of medicine that there was no objection to my teaching dentistry if I could only fulfil the conditions which were necessary for every teacher of medicine. One of those conditions was that three years must elapse after my last examination. I had therefore to wait till 1887, and then publish a new treatise on the basis of which a trial lecture for the faculty was allowed before I could deliver the inaugural speech as a teacher.

With this, I had created a basis for my, as yet, unfixed aim to open a dispensary for dental and mouth diseases and afterwards to found a dental institution.

Unexpected difficulties arose, support from the university failed and we had to provide room and educational appliances ourselves.

The number of students was very small in the beginning, and the patients necessary for the study could not easily be found, as the public had not the slightest notion of the importance of modern dentistry in the work for public hygiene.

From my private practice, where, from 1885 on, children and soldiers were given treatment gratuitously, I sent all patients that I thought suitable to the dispensary, where also they were treated gratuitously. In this way, the foundation was laid in 1888 for the school dental clinics and dental treatment in the army.

This private institution was taken over by the government in 1893. The school dental clinic was separated from the university institution in 1902 and furnished anew by the municipality. This became the first municipal school clinic for dental care, and it had been founded in 1885 as a private institution.

This example set by Strasbourg was soon followed by other towns and municipalities to the number of forty-two in 1909. Thereafter the German Central Committee for Dental Care at School was founded, and as a result of its activity, there were, in 1911, seventy-eight school clinics for dental care. This number increased to 209 in 1913.

In 1909, the Fifth International Dental Congress met, and here a reorganization of the Hygiene Committee of the F. D. I. took place. Since that time, the activity of the committee has contributed to an important degree to the furthering of school dental care and to the recognition of its merits in every country.

I need not mention details here. They are contained in the International Archives for Public Mouth Hygiene published up to 1914 by the Hygiene Committee of the F. D. I.

The cooperation of the dentists with the school doctors, teachers and authorities was of great benefit to the health of the children and at the same time served the coming generation. The sooner the treatment is begun and the more systematically it is continued, the greater the number of well-cared for children will be, the larger the number of school clinics for dental care, and the surer the success of the treatment.

In the kindergardens at Strasbourg, the systematic treatment of children from 3 to 6 years old was begun. If the parents would not consent to the complete course of gratuitous treatment, the child could be dismissed from school.

No child was admitted to the children's holiday camp without a certificate from the dental clinic that the mouth was absolutely clean. The result was that the school doctor found a much greater increase of weight in the children than formerly.

In the kindergardens, every child received a free toothbrush from the municipality, so that, under the guidance of the teachers, dental care could be given daily.

At the elementary schools, the teachers ascertained yearly how many children took care of their teeth and how many owned toothbrushes, in order that the school clinics might furnish toothbrushes to those without them.

Pictures about teeth and their treatment, representing sound and diseased teeth, were provided for all schools and were used in teaching. The reading books contained lessons about the importance of sound teeth for health in general, and exercises were assigned on this subject, everything being done to popularize dental care.

Without the support of the school, no dental school clinic can fulfil its task and reach its aim. Its purpose is, however, to treat all school children systematically and in such a way that no child leaves school without perfectly sound teeth.

Only by the general spread of dental care at school in all countries, by systematically impressing the necessity for it, is the need recognized. Out of this need grows the movement to furnish all children with this care.

There is only one way to accomplish this; that is, to provide rational dental care at schools, with systematic prophylaxis, and to train the children to care for their teeth.

School dental clinics are a means of fighting anemia, neurasthenia, many infectious diseases and tuberculosis, as Kirchner explicitly states, as these conditions are undoubtedly aggravated by an unhealthful oral condition.

The school dental clinic can be used, through the cooperation of the authorities, teachers and doctors, to educate school children in general physical care.

If these theories are properly applied everywhere, we may safely accept the motto: "The school dental clinics are the basis on which public health is built."

REPORT OF PUBLIC DENTAL HEALTH ACTIVITIES IN CANADA*

By FRED J. CONBOY, D.D.S., Toronto, Canada

CONDITIONS which affect the problem of providing dental treatment for all classes of society are quite different in the Dominion of Canada from those which pertain in the older nations. It is true that we have some congested areas where public clinics are needed because the people

*Read before the Section on Mouth Hygiene, Preventive Dentistry and Public Health at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 24, 1926.

cannot afford to pay dental fees, but it is also a fact that, in such a very large country, with a comparatively small population, there are many districts so sparsely settled that the inhabitants are forced to travel long distances in order to reach a center where there is a resident dentist.

The public health workers are confronted with the task of carrying dental health education and dental treatment to those who, although they could manage to pay ordinary fees, cannot afford to spend the time and money needed to carry them to the place where the service may be secured. This is especially true in the newer districts and unorganized territory where the early settlers and pioneers have established their homes and are making a strenuous effort to gain a comfortable living.

The problem is solved by the traveling clinic and the community nurse. Traveling by train or automobile, and staying in each town or village a sufficient length of time to complete the work, and then moving on to the next community, these itinerant dentists are accomplishing a most necessary and efficient work. The public health nurses operating in the sparsely settled districts go from house to house and carry to the people the message of better health, including instruction in oral hygiene. They also arrange for dental clinics at certain centers, and the nearest dentist takes charge of the work.

A number of the more recent graduates are pioneer spirits, and they operate under conditions which are not exactly ideal. These men, however, enjoy their work, being conscious of the fact that they are rendering a real service to people who deserve the best that dentistry can give them.

Public dental service in the older parts of Canada is very similar to that found elsewhere. We have our school and preschool clinics for children, our hospital departments for in and out door patients, our factory clinics and our dental health educational work. These activities are being carried on to a greater or less extent in each of our provinces, and if time permitted, I could present a long list of worth while accomplishments.

Starting in the extreme west, in the Province of British Columbia, we find that the school dentists and those associated with the hospital departments are doing a most efficient work. The same is true in the prairie provinces, and while the task of providing service for the people in rural districts is difficult, the urban centers are well supplied with dentists and public dental services have been organized.

The Province of Ontario has a full time director of dental service connected with the department of health. He works in cooperation with an oral hygiene committee appointed by the Ontario Dental Association, and the department thus secures the wholehearted support of the dentists of the province. It is impossible to make permanent progress in connection with the establishment of public dental service unless the dental health officers have the sympathetic support of the resident dentists, and the best means of securing this help is to have the local dentists visit the schools and see the condition of the children's mouths. In order to accomplish this purpose, to inform the parents in regard to their children's dental defects and to bring to the attention of the local school and health boards the necessity for the establishment of

school dental clinics, it was decided to conduct a province-wide dental survey, the resident dentists making the examination gratuitously and the provincial department of health supplying all the needed material, in the form of notification cards, report forms etc.

At the close of the school year, more than 200,000 children had been inspected, and such interest had been aroused that a number of new school dental services were established. This survey will be completed during the coming year. The success of this venture so encouraged the department of health and the profession that it was decided to extend the work to include the adult population, and so arrangements have been made for an Ontario Dental Health Day to be held, October 20. Many activities have been organized, including free dental examination and advice for all who desire it, special dental health plays and contests in connection with the schools, a dental health educational film in each of the motion picture theaters, oral hygiene talks over the radio, newspaper articles on preventive dentistry and public meetings of various kinds. All the principle health, educational and social welfare organizations are cooperating and the effort promises to be a great success. The most encouraging feature about the organization of these undertakings is the whole hearted and enthusiastic manner in which the other professions and the lay associations show their willingness to assist, and the contributions which they are willing to make are far beyond what might reasonably be expected. The permanent school dental services in Ontario are well organized, all the cities and many of the larger towns having a clinic of some kind. In Toronto, the dental staff consists of twenty-nine dentists on half time and four on full time and the annual appropriation for this work amounts to $57,000.

Free dental clinics have been in operation in Quebec for over thirty years. These have been connected with various charitable institutions and the dentists gave their services gratuitously. Modern public dental service began in 1922, and, at the present time, there are a large number connected with the schools, hospitals and orphanages. The dentists are carrying on an aggressive dental health educational campaign and the government has under consideration the question of establishing a provincial dental health department.

Nearly all the important towns in Nova Scotia have school dental clinics. For the most part, the dentists give their services without remuneration, but, in the larger cities, the school dental officers are paid by the municipality. The public dental clinic at Halifax is operated as part of the general health clinic and works very well with the other departments. Halifax has had a preschool age dental service for some time, and the general and children's hospitals have dental departments. For a number of years, a traveling health caravan, including a dental clinic, covered a large section of Nova Scotia. One of the most important and far-reaching departments of work in the province is the organized effort made by the profession to interest medical students and teachers in training in oral hygiene and dental health. Through a course of lectures and by attendance at the clinics these students, who, in a short time, will become physicians and teachers, are led to realize

the important influence which dental conditions have on the general health.

From this short review of the work in some of the provinces, you will realize that school dental services are being considered an essential part of an efficient public school system and that the majority of our larger hospitals recognize the value of a dental department. We have not made much progress in connection with the establishment of industrial clinics but this has been due to business depression rather than a lack of appreciation of the necessity for the work. Many firms have determined to establish such a service as soon as industrial conditions justify the expenditure. Educational work has been carried on in a most enthusiastic and effective manner, and the general public are becoming well informed in regard to oral hygiene and dental health. Many of the leading newspapers contain interesting and instructive articles. Radio talks are broadcast regularly, and dental health films are shown in the theaters. Members of the Ontario Dental Association can, on request, have sent to them, by their oral hygiene committee, without charge, a lantern and slides, a motion picture machine and films, an oral hygiene display, dental health plays and scenery, charts, newspaper articles and booklets to distribute to the general public. This arrangement, which makes it easy for them to secure the assistance they may require, has encouraged the local dentists to give talks in factories and before service clubs and social welfare organizations.

The Canadian Dental Hygiene Council, an organization composed of dentists and laymen, is arranging to provide a similar service for the other provinces. This association is also interested in the dental condition of the immigrants coming into the country and hopes to work out a plan whereby all these new citizens will receive dental examination and the necessary treatment.

In Canada, all health matters are under the control of the provincial government, and the Canadian Dental Hygiene Council acts in the capacity of a dominion department and, in an advisory sense, supervises and correlates the work in the various provinces. The lay members of the council are outstanding men, who recognize the value of dentistry as a public health activity and consequently take a real interest in the work.

The patients and inmates in all our government hospitals and institutions receive dental treatment of some kind, and this service is being gradually improved.

The prospects for the future are exceedingly bright. The members of the profession are conscious of the fact that they are public health workers and that they have a responsibility to all the people in the community. They are, therefore, willing to cooperate in connection with all dental health educational movements and to support the public dental health officers in their work. This helpful attitude has shown itself in a greater willingness to work for children and a greater appreciation of the necessity for saving the deciduous teeth. The general public are beginning to realize the danger of neglecting mouth conditions and to estimate properly the value of efficient modern dentistry. They are therefore willing to support the health authorities and the profession of dentistry in the establish-

ment of public services and the promotion of dental health educational campaigns. The Canada of the near future will be a country which gives first thought to the welfare of its citizens and, in the organization worked out to protect the public health, dentistry will have an important place.

REPORT ON THE ACTIVITIES OF THE HYGIENE COMMISSION, F. D. I.*

By J. S. BRUSKE, Amsterdam, Holland

THE Hygiene Commission, F. D. I., is an advisory body which inquires into the problems within their scope and gives advice. The F. D. I. is a professional association which, during the intervals between international congresses, keeps in contact with the tendencies in dentistry and also endeavors to advance dentistry on an international basis. Similarly, the Hygiene Commission is endeavoring to advance oral hygiene throughout the world. The committee inquires into the progress and requirements of oral hygiene in all affiliated countries and seeks every possible means of making dreams a reality.

Recently, the Hygiene Commission has adopted a system of international research for this purpose. The basic principle is that only the best results should be striven for. To this end, the Hygiene Commission sifts the replies and information from all countries and, by a comparative study and exchange of thoughts between the delegates, tries to arrive at a uniform program.

The Hygiene Commission was founded in 1902 and, under the leadership of Professor Jessen, from 1909 to 1914, has devoted itself to school dental care, under the motto: "Dental care at school is fundamental to public health." I am considering that it is known what an important share Professor Jessen has had in this successful propaganda. Since 1888, he has been sacrificing the major part of his life to this provision. George Cunningham, of England, and Albin Lenhardtson, of Stockholm, his energetic collaborators, have achieved remarkable success. During the London Congress in 1914, activities were interfered with. Not until 1923 could they be resumed. This meeting took place under abnormally difficult conditions; first, because the means which the Hygiene Commission had previously at hand were completely lost; secondly, because the currency in most of the affiliated countries had depreciated to such a level as made financial support wholly impossible; thirdly, because the International Archive for Public Oral Hygiene was no longer in existence.

In the meantime, the idea of dental care at school had entered many civilized countries and, in some instances had been in practice for years so successfully that it could favorably compare with other branches of public health care at school. In fact, whereas medical care at school is largely re-

*Read before the Section on Mouth Hygiene, Preventive Dentistry and Public Health at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 23, 1926.

stricted to an examination, dental care has developed into effective and preventive treatment.

This task, by a resolution of the Geneva assembly, is allotted to one of three subcommittees. The problem to date also involves obtaining the best possible results at the lowest possible expense.

Efficient propaganda on behalf of prenatal care, as referred to in a Geneva resolution, should be taken up simultaneously.

Besides dental care at school, the Hygiene Commission has to solve the problem of community dental care. The care of adults does not arouse such interest as does school dental care. This not only refers to the public at large, but also to public health authorities and officers in hospitals; sick funds; industries, etc. The laity is unaware of the fact or fail to realize that dental care of the masses means prevention of systemic disease to a great extent. In many cases, children have left school with sound teeth, but a lack of dental care for youths and adults is responsible for the undoing of what had been laboriously accomplished.

The prophylactic means at hand to check the carious process are inadequate, as they are only reparative, aside from being hygienic and cleansing. Moreover, everywhere the masses cannot afford expensive and tedious dental treatment, and this fact leads to neglect of the mouth and subsequent undermining of the general health.

In order to bring these facts to the knowledge of the authorities concerned, it is necessary to take separate action.

To be successful, the Hygiene Commission must continue research work, in order to be posted about the progress of oral hygiene all over the world. This was clearly illustrated by the results of an inquiry in 1923 into the organization of public dental care. From the first report, it appeared that only in two countries of twenty-one could the organization meet requirements laid down in a resolution unanimously adopted in Luxemburg in 1924, and reading as follows, "Dental care of the people should be officially acknowledged to be an integral part of public health care."

This inquiry was continued more in detail in 1924, being based on a number of angles submitted to the delegates for consideration. In connection therewith, there were appointed three permanent subcommittees, each of which was under an officer of the committee as chairman: Subcommittee for Dental Care at School, chairman, E. Haderup; subcommittee for Public Dental Care, chairman, F. Watry; subcommittee for Oral Hygiene Research, chairman, F. Ferrand.

As another important step in their task, within the scope of their activities, the Hygiene Commission took preliminary steps to found an institution for scientific research in oral hygiene.

In 1912 at Stockholm, Professor Jessen had suggested the establishment of an international institution for hygiene, in the Peace Palace at The Hague, Holland. This idea was not worked out. At the first meeting of the Hygiene Commission in 1923, the subject was taken up again by Mr. F. Ferrand, Paris. At Luxemburg in 1924, the idea of establishing the institution was adopted, without indicating a seat. At Geneva in 1925, Paris was selected. At the same time, the international character of the institu-

tion was clearly stipulated. The task was outlined as the advancing of scientific research on oral and dental care. A more detailed explanation will be submitted in a special paper.

It is the idea, according to the Geneva resolution, that, in every country affiliated in the F. D. I., a branch of this institution shall be established, so that everywhere scientific research on oral hygiene will be controlled by international collaboration. Here, too, the questionnaire method may be successfully applied by the subcommittees concerned.

Opinions of authorities differed with respect to the value of the toothbrush. The Hygiene Commission instituted an inquiry, and, in Geneva, a resolution was adopted, as published in the first, second and third issues of our periodical.

In Geneva, it was decided to establish the periodical just mentioned, and I was charged with the oral hygiene section. In this periodical, the results of the research, based on the exchange of thoughts, are to be published. It shall appear in four languages, and be distributed to the dental profession all over the world free of charge.

In this periodical, social dental problems are to be subjected to extensive research. The results should attract the attention of the authorities in charge of public health and may induce them to adopt the same measures.

The first issue, which appeared prior to the meeting at Geneva, met with general approval. For the second issue, a great number of experts have expressed their willingness to contribute regularly. This insures it an international character. I am availing myself of the opportunity of conveying the thanks of the Committee to all of them.

Now it would seem necessary to maintain a central office, in close contact with the committee, to organize the work of the Hygiene Commission, which comprises almost the entire work of the Hygiene Commission.

At the final session of the F. D. I. in 1926 at Geneva, the president of the E. C. instructed our chairman to establish relations with the Hygiene Commission of the League of Nations. Our chairman and secretary complied with this request and received a satisfactory answer, which was published in the Hygiene Commission periodical.

We trust that the League of Nations will understand the benefits of international advancement of oral hygiene for public health and we hope that this will lead to collaboration with our committee.

The seven resolutions submitted to you by the president of the Hygiene Commission, F. D. I., are the results of the work of the committee during the last years. They are based on the results of questionnaires on the one hand, and of discussions at the sessions of the Hygiene Commission on the other hand. In Luxemburg and Geneva, they were passed unanimously, and were subsequently sanctioned by the E. C. of the F. D. I.

If the Hygiene Commisison expects to accomplish anything in the future, they must have your approval and support; for only if our entire profession is willing to collaborate will the Hygiene Commission be enabled to assist the oral hygiene movement to develop along the lines of evolution and on an international basis, for the benefit of advancing public health; that is: humanity.

HEALTH EDUCATION IN A DENTAL CLINIC

By DESDEMONA HEINRICH,† Kansas City, Missouri

THE accompanying picture shows a group of children from the Kansas City Public Schools who have been brought by the school nurse to the Children's Dental Clinic at Deaner Institute.

A class in health education at the Children's Dental Clinic, Deaner Institute, playing the "Food Fun Game."

The clinic aims to do more than to repair teeth after the damage has been done, more even than to teach the doctrine of clean teeth. There is a regular program of teaching food habits that build sound teeth. A nutritionist directs the activities of the children while they are awaiting their turn for dental treatment. An adequate diet with good health habits is the keynote. This is expressed in various ways: First, there is a story or a discussion for all the children. Then they break up into groups according to age and occupy themselves with some activity fitted to their years. The older boys usually take books or magazines and go off in a corner to read. An older girl may play little mother to a younger child and help in some kindergarten occupation. Best of all are the health games in which all join. The Food Fun Game is an especial favorite. A revolving

†Nutritionist, Deaner Institute.

wheel bears on it statements of food habits, with a plus score for the good and a minus for the poor habits. As the wheel stops, the child who has spun, tells why that food habit bears its particular score. When the accompanying picture was taken, the photographer was quite forgotten, so engrossed were the children in the question of why "I eat dates, figs and raisins" should count + 10, while "I eat candy between meals" counts — 20.

To interest the child in good food habits is the starting point, but it is not the whole story. The nurses who visit the clinic are more than grateful for the help in their work. Coming to the dentist is not an ordeal for the child—it is a pleasure. The school teacher and the principal know that, although the child is absent from class room work for a part of the day, he is bringing back health education as something vital.

The nutrition department reaches beyond the school into the homes. This year, the first year of this new enterprise, the nutritionist has given twenty-seven talks on food and nutrition to parent-teacher associations and preschool circles. Three courses of cooking demonstrations "Wholesome Foods for Children" have been given in the cooking laboratory at Deaner Institute.

Kansas City is strong in the organization of its school system and is fortunate in having men of vision who are ready to stand behind enterprises which can point the way for better health education. The first year of this nutrition department attached to a dental clinic has vindicated itself. The future offers new opportunities.

THE ONTARIO DENTAL HEALTH DAY

The Ontario Dental Health Day, Oct. 20, 1926, was planned by the Ontario Department of Health for the purpose of bringing to the attention of the laity the harmful results caused by diseased mouth conditions, and instructing the public so they may be in a position to assist in connection with the prevention of dental diseases.

The department found the various health, educational and social welfare organizations quite willing to assist, and the following agencies lent their active cooperation: Ontario Medical Association, Ontario Dental Association, Canadian Dental Hygiene Council, Registered Nurses Association of Ontario, Red Cross Society (Ontario), School Health Section of the Ontario Educational Association, Imperial Order Daughters of the Empire, Ontario Social Hygiene Council, Ontario Retail Druggists' Association, home and school clubs, women's institutes, service clubs, Toronto Film Board, radio stations, Ontario Retail Merchants Association, dental dealers, manufacturers of mouth health products, churches, the Young Men's Christian Association and the Young Women's Christian Association.

We also enjoyed the support of the majority of the newspapers and a number of magazines.

The activities arranged included:

1. Motion pictures in theaters and town halls. The Ontario Motion Picture Bureau provided 225 prints of a special Ontario dental health film. The scenes for the picture were prepared and staged by the Toronto Department of Health and the prints were distributed by the various exchanges through the Ontario Motion Picture Distributors. By this arrangement, the necessity of providing heavy metal boxes (as required) for shipping these films was obviated. They were sent by the exchanges to the theaters as part of the weekly consignment.

The Ontario Motion Picture Bureau also provided five regular length standard and six Pathescope size films. These, with a number of standard and Pathescope pictures in the possession of the department of health, enabled us to supply programs for matinees and public meetings. All the large theaters in the province showed the special film.

2. Radio messages. A radio message was broadcast from each radio station in On-

tario and from four in the United States. In Toronto, the people who listened in, heard talks on dental health on five consecutive nights, three messages were sent out from Hamilton and a number from Ottawa. London, Brantford, Preston, Prescott were other centers from which messages were sent.

3. Public addresses. Special speakers were provided for service clubs, women's institutes, home and school clubs, church organizations and other groups. Talks were given in shops and factories, and public meetings were held.

4. Work in schools. Each teacher in the public and separate schools gave a mouth hygiene lesson. Special booklets (dental guide) containing modern material on the subject were given to the teachers. Essay and art competitions were held and prizes given. The high school students were addressed by dentists. The public school inspectors cooperated in a most enthusiastic manner, and members of the profession addressed the teachers' institute, which met a few weeks before the Health Day in order to inspire the teachers to cooperate with the campaign.

5. The dental play, "A Bad Baby Molar." Forty-five sets of scenery for this play were sent out to different parts of the province. The set consisted of a copy of the play, a large picture of the face, the patterns for the teeth, instructions for the preparations of the scenery and a photograph. The large paintings of the face were prepared by a local artist. The paper was then cut into sections and the whole enclosed in a suitable folder. The play was presented at mass meetings of school children held in the afternoon and to parents' meetings in the evening.

6. Free dental examination and advice. The dentists of the province gave a free dental examination and advice, including instruction in mouth hygiene to all who requested this service on Health Day. In the larger centers, special clinics were organized, while in the smaller places, the dentists received the people in their own offices. Besides giving this service, the members of the profession made a dental survey of 40,000 children. Free radiograms were taken for the patients in the larger clinics.

7. Cooperating agencies. One of the most encouraging features of the Ontario Dental Health Day campaign was the spirit of cooperation on the part of lay organizations. The insurance companies prepared and distributed interesting and instructive dental health folders to their policy holders. One company sent out 100,000 of these booklets. Letters requesting the local branches of the various organizations to have a part in the effort in each municipality were sent out by the provincial officers of the service clubs, Imperial Order Daughters of the Empire, women's institutes home and school clubs and others. The United Church of Canada sent a communication and booklet to each minister in Ontario, and the Presbyterian Church rendered valuable assistance. The local committees found it easy to get the assistance of the local branches when they had received such a communication from their own executive officers.

8. General publicity. The general publicity was provided by posters, automobile stickers, newspaper advertisements placed by manufacturers and distributors of pure food articles and mouth toilet preparations, dental health articles in the press, attractive window displays and slogans on sign boards. The only difficulty experienced in connection with the whole campaign was to get the support of some of the newspapers. They felt that they should be paid for publicity of this kind. Nevertheless, newspaper articles prepared by the department appeared in a great majority of the papers.

9. Government departments and officials. The Ontario Department of Health had the support and assistance of the other branches of service in arranging for this undertaking; the department of agriculture, through the women's institute branch and district representatives, the department of education, through the public and separate school inspectors and the teachers' institutes, and then the other divisions of the health department. The plan was worked out so that a new body of workers would be put at the task at different times as the undertaking progressed. The dentists, physicians, nurses, social welfare workers, school teachers and medical officers of health were brought in in turn, and thus a helpful interest was maintained throughout the entire campaign.

10. Preliminary arrangement. From the standpoint of real dental health education, we are convinced that the work done in organizing the effort is just as valuable as the health day activities. The thousands of letters sent to the leaders in the various walks

of life, the addresses given at conventions and all the work done to secure support must do much to promote better dental health, and even the dentists who were called on to give public addresses will profit by the study they gave to the subject of mouth hygiene. Fifty-five sets of slides and twenty sets of charts were sent to members of the profession to assist them in presenting the subject of dental health to the people.

All the activities arranged for the Ontario Dental Health Day were of an ethical nature. We made no effort to stage a big show, but carried through the arrangements in a quiet, dignified way. At the same time, we organized the work so that our dental health message would be presented to all classes of our citizens. The department is glad to know that, in this province-wide effort, they enjoyed, and still have, the confidence and support of the professions and organizations interested in the health and education of the people.

FRED J. CONBOY, D.D.S.,
Director of Dental Services,
Ontario Department of Health.

THE MASSACHUSETTS VISITING AND INSTRUCTIVE DENTAL HYGIENE CLINIC.

This clinic has been an answer to the need of many communities of stimulating interest in dental hygiene by a regular educational campaign. It should be added that under special circumstances a local dentist may use part of the equipment of the clinic to do some of the most urgent extractive and fissure work that the hygienist has reported the first week of the clinic.

The following is an outline prepared by the Dental Hygiene Council.

VISITING AND INSTRUCTIVE DENTAL HYGIENE CLINIC.

WHAT IT IS AND WHAT IT AIMS TO DO

A SOLUTION

WHAT IT IS:

A traveling clinic equipped and directed by the Dental Hygiene Council of Massachusetts.

HOW MANAGED

This clinic is conducted by a graduate dental hygienist with special training in school or public health work whenever possible; assisted by a number of undergraduate hygienists from Forsyth Dental Infirmary (the number varying with the size of the town and the funds available).

WHAT IT AIMS TO DO:

This clinic carries on a dental health campaign in the schools of communities where no regular hygienist is employed. It demonstrates the value of such a service and aims to prove to the community the value of having healthy mouths for its school children. The Clinic:

1. Examines all children in the schools.
2. Gives prophylactic treatment for the first three grades.
3. Refers all reparative work to the local dentist—(private or public as the case may be).
4. Puts on a dental health campaign.
5. Examines preschool children and gives advice to mother.

How campaign is run:

1. The dental hygienist will have personal interviews with:

a. Superintendent of schools.
b. Chairman of board of health.
c. School physician.
d. Local dentist.
e. School or community nurse.
f. Head of parent-teacher association, if there is one. To get their cooperation and suggestions as to the special methods of the community. (These conferences should be held before the clinic starts if possible, unless a letter has been sent telling of the aim and scope of the campaign to be held.)

2. Meeting with teachers:

a. The hygienist will meet with all teachers and secure their cooperation in such ways as:

1. Grade teachers—100% "healthy mouth" rooms—distributing leaflets (Massachusetts Department Public Health).
2. Drawing teachers—poster contest.
3. Music teachers—health songs.
4. Domestic science teachers—proper food for tooth construction.

3. Newspaper publicity:

The hygienist will interview the editor of the local papers, getting space for pictures of clinic if possible, and articles by local dentists to advertise campaign and acquaint community with results.

4. Talks:

Hygienist will give short schoolroom talks to all grades.

5. "Dental Health Day":

The hygienist, with the cooperation of the teachers, will stage an entertainment at the schoolhouse, town hall, or community health house.

Each grade will have some part in the program which will vary according to size of town.

Plays, songs, stories, slides, and movies are obtainable from the Massachusetts Department of Public Health.

WHAT IT HAS DONE

A Demonstration

The Visiting and Instructive Dental Hygienic Clinic has been to the following towns: Danvers, Peabody, Westboro, Andover, Wrentham.

"Communities having once availed themselves of this service invariably request a return visit or establish their own dental clinic. Hundreds of school teachers and nurses who have come in contact with this project endorse it unhesitatingly."

A Concrete Example

Report of Clinic at Danvers—1925

Fifteen hundred pupils were examined for dental attention—children from first to eighth grades. Notices of work needed were sent home. A public meeting was held at which the second grade staged a play—"The Bad Baby Molar"—and the first grade gave a toothbrush drill.

Number odontexesis (cleaning), 521; schoolroom talks, 39; toothbrush drills, 43; (fifteen-minute talk given with each drill); newspaper articles, 4; conferences (school teachers, etc.), 10; public meetings, —; health plays and lectures in schools, —; slide lecture on the importance and care of teeth, —; number movie theaters—; dental films shown, 3; places posters shown, 35; number times Massachusetts Department of Public Health films shown, 4.

Danvers has had this clinic for three years, and they are getting splendid results.

It Can Do the Same for You

WHAT THE COMMUNITY MUST DO

This clinic is run at cost, usually from $40 to $50 a week, depending on location of town. This amount covers all necessary expense to the community, except tooth powder or brushes, which will be furnished at cost. The community must:

1. Guarantee and assume responsibility for operating the clinic and pay each week by certified check.
2. Secure living quarters—not to exceed $7.00 per week.
3. Transfer clinic equipment from express office to location of clinic and back.
4. Furnish suitable quarters for the clinic.
5. Assume legal responsibility for cleaning and examining children so treated.
6. Cooperate with hygiene council and state health officials in advertising clinic and its purpose.
7. If possible, assign assistant to the hygienist—someone familiar with local conditions to help with the children and lectures.
8. Arrange for hall in case of public meeting.

DENTAL HYGIENE REPORT

THE PROMOTION OF THE WELFARE AND HYGIENE OF MATERNITY AND INFANCY

The act for the promotion of the welfare and hygiene of maternity and infancy, passed by Congress, Nov. 23, 1921, which is popularly known as the Sheppard-Towner Act, makes available to the states that will raise a similar amount, federal funds to aid in reducing maternal and infant mortality and promoting the health of mothers and infants. At the close of the fiscal year 1925, all states except Connecticut, Illinois, Kansas, Maine and Massachusetts were cooperating under the provisions of the act. A report of the dental hygiene activities taken from the bulletin on "The Promotion of the Welfare and Hygiene of Maternity and Infancy," published by the U. S. Department of Labor, Children's Bureau (Publication No. 156) is as follows:

"Dental attention given to preschool children was reported in connection with the general physical examination of children at conferences in most of the States in which dental examination was mentioned as included in the maternity and infancy work. Dental conferences or clinics were reported by 15 States, and more than 13,000 children were given attention at a total of 330 such conferences. In Pennsylvania assistance in this phase of the work was given by a division of the State department of health which regularly devotes most of its attention to dental care for children of school age.

Full-time dentists or dental hygienists were

reported as on the staffs of only two States. In the other States reporting dental conferences or clinics the work was done by dentists volunteering their services or employed for short periods of time. Frequent mention was made in State reports of the generous cooperation of local dentists when child-health conferences were held in their communities. In Virginia, especial emphasis was put on dental hygiene work, 2,033 preschool children having been reached during one six-month period.

Dental care during pregnancy and the nursing period has not as yet been given the attention which is admittedly desirable. However, the importance of care of the teeth is emphasized in prenatal conferences and literature dealing with prenatal care."

FIELD NOTES*

Nebraska has a Committee on Oral Hygiene Education, of which Dr. F. F. Whitcomb of Omaha is chairman. There are now thirty-eight states with committees on mouth hygiene and public instruction.

Louisiana is added to the states having committees on mouth hygiene and public instruction. There is also a dentist, Dr. Fred Ratzburg of Shreveport, representing dentistry on the State Board of Health. At present the following states have members: Connecticut, Georgia, Illinois, Maine, Michigan, Mississippi, New Jersey, North Carolina, North Dakota, South Carolina, Virginia and Louisiana.

During the past year Dr. T. Wallace Sorrels, president of the Oklahoma State Dental Society, has been serving as a consultant to the state department of health in an unofficial capacity. Through him, the dentists of the state are interesting the state department of health in establishing a bureau of mouth hygiene. It is hoped that Oklahoma will be the thirteenth state to have a full time worker with the state department of health.

Alabama has recently appointed a Committee on Mouth Hygiene and Public Instruction of the State Dental Society.

Utah and South Carolina are now added to the states having committees on mouth hygiene and public instruction.

*The Department of Dental Health Education will be glad to receive items of news along the lines of education in dental or general health.

In Appleton, Wis., a dental service for indigent children is supported by the Kiwanis Club, which pays the dentist, and by the board of education and the city. Early in the school year, an examination is made of the teeth of all the school children, and reports are sent to the parents, urging them to take their child to their regular dentist. When parents are unable to do this, the child is treated at the clinic.

At the last meeting of the Reno County (Kansas) Dental Society the county superintendent of schools and the local superintendents spoke on the desirability of making a dental survey and establishing a dental service in the public schools. Plans are now being developed.

The Professional Women's Club of Mt. Clemens, Mich., is financing the dental service in the schools. Dr. R. W. Johnson, a member of the Detroit Board of Health has been loaned to Mt. Clemens. He is making examinations, operating in cases of urgent need, and lecturing in the grades.

Natchez, Miss., has again opened its dental clinic for indigent children. Already St. Mary's Orphanage has 100 per cent mouth corrections and the Red Cross nurses are urging other schools to compete for this honor.

Dr. W. R. Davis of Lansing, Mich., dental director of the state board of health, recently met the members of the Tri-County Dental Society, health officers, members of school boards and superintendents of schools in the various towns to formulate plans for employing a full-time dentist in Berrien, Cass and Van Buren counties.

Although Hawaii is far away from us geographically, it is not far from us dentally speaking. An interesting dental health program is being carried on in the Territory. A full-time dentist, employed by the Board of Health of the Territory at Hawaii, works for three territorial institutions. On the advisory committee of the department of public instruction, there are three dentists. There are also four full-time dentists and twenty dental hygienists, with a supervisor, who are employed in the Territory. The department of public instruction furnishes the supplies and transportation of equipment in the dental program, while the dentists pay their own traveling expenses and furnish their own hand instruments from their salaries.

Medical and Dental News

Arkansas

Southwest District Reelects Officers: The Southwest Arkansas District of the Arkansas Dental Society voted recently to retain the present officers, as follows: president, K. R. Spearman, of Texarkana; E. L. Watson, Camden, vice-president, and A. W. Hudson, Prescott, secretary-treasurer. It was voted to hold annual rather than semiannual meetings hereafter.

Kansas

Northeast District Society Elects Officers: The following were recently elected officers of the Northeast District Kansas Dental Society: president, E. J. Harold, Sabetha; vice president, R. E. Welch, Sabetha; secretary-treasurer, C. L. Hixon, Atchison, at the annual two day meeting. The 1927 meeting will be held in Hiawatha.

Missouri

Dr. Winter Honored: A testimonal dinner was given in honor of George B. Winter, of St. Louis, by the St. Louis Dental Society, December 6, in the Ball Room of the Hotel Statler. J. F. Alcorn, president of the society, presided, and J. P. Marshall, first vice president, acted as toastmaster. Taking part in the program were Henry L. Banzhaf, Milwaukee, Wis., President of the A. D. A.; M. C. Marshall, St. Louis; Otto U. King, Chicago, Ill., Secretary of the A. D. A.; C. R. Grissinger, Pittsburgh, Pa.; W. F. Whalen, Peoria, Ill.; R. Boyd Bogle, Nashville, Tenn. and Donald M. Gallie, Chicago, Ill. About 350 guests were in attendance.

Southwest Missouri District Society Meets: At the recent annual meeting of the Southwest Missouri District Dental Society the following officers were elected: president, L. Brooks Montgomery, Joplin (reelected); vice president, H. I. Maness of Anderson; secretary-treasurer, T. D. Miller, Joplin. A. L. Walters, of Tulsa, spoke on "Diet and Its Relation to Focal Infection." J. D. White, of St. Louis, spoke on "Fixed Bridgework" and George B. Winter, on "Extraction of Impacted Third Molars."

Dr. Keys on Dental Board: Edward H. Keys, St. Louis, was recently appointed a member of the dental board of Missouri to fill the unexpired term of W. A. Roddy, deceased.

Nebraska

Southwest District Society Officers: The Southwest District Dental Society at its annual meeting, in Alma, elected the following officers for the ensuing year: president, J. G. Colgan, McCook; vice president, Mack Meredith and secretary-treasurer, Roy P. Johnson, both of Superior. Holdrege was selected for the meeting place of the next annual session.

Dental Examiners Elected: George M. Boehler, of Omaha, was elected president of the state board of dental examiners in November, with W. A. Cox, Omaha, vice president and Ferdinand E. Griess of Sutton, secretary.

North Dakota

Dr. Moskau Appointed Examiner: Gilbert Moskau, of Grand Forks, was recently appointed a member of the North Dakota State Dental Board.

New York

Jefferson County Society Meets: The Jefferson County Dental Society, at its annual meeting, at Watertown, elected the following officers: president Earle M. Crysler, vice president, Louis Stabins, secretary-treasurer, Frederick H. Doner (reelected), all of Watertown. John J. Posner, of New York, gave an illustrated lecture on "Local Anesthesia Simplified," and clinics were given by Drs. Posner, Howard A. Cheney, Yonkers, and F. H. Kelly, Ogdensburg.

Tennessee

Fifth District Society Elects Officers: At the annual meeting of the Fifth District Dental Society held in Fayetteville, the following officers were elected: president, R. L. Lassater, Fayetteville; vice president, M. D. Meadows, McMinnville, and secretary-treasurer, J. C. Taylor, Fayetteville.

Virginia

Dr. Thompson Joins Medical Staff: Milton N. Thompson, a 1923 graduate of the University of Minnesota, has joined the staff of the Medical College of Virginia, School of Dentistry. Dr. Thompson will give full-time service teaching in the technic laboratories and on the infirmary floor.

Death of Dr. Brodnax: John W. Brodnax, associate professor of anatomy and instructor in drawing at the Medical College of Virginia, died, October 20, age 62. Doctor Brodnax gave full-time service to the school of dentistry of the college during the second semester of each year.

Dr. Shaw Discovers New Organism: Discovery of a new monilia by Frederick W. Shaw, associate professor of bacteriology, School of Dentistry, Medical College of Virginia, was reported in a recent number of *Science.*

Freshman Registration at Virginia College: Forty students matriculated in the freshman class, School of Dentistry, Medical College of Virginia, this session. This is the largest freshman registration since the college in 1921 adopted the predental collegiate year as a requirement for admission. Four members of the 1926 entering class hold baccalaureate degrees.

General

Tri-State Clinic Elects Officers: At the seventh annual convention of the Tri-State Dental Clinic, the following officers were elected: president, L. B. Sims, McGehee, Ark; vice presidents: G. C. Jernigan, Rector, Ark., J. C. Luper, Okolona, Miss., E. J. Justice, Memphis, Tenn., and secretary-treasurer, T. R. Ogden, Memphis, Tenn. (reelected).

Deaths

Bell, Isaac P., Detroit, Mich.; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1892; died, a suicide, after a severe attack of influenza; aged 47.

Ford, Don B., Cleveland, Ohio; Western Reserve University, School of Dentistry, 1905; died recently in Chula Vista, Calif., where he had gone two years ago in an effort to regain his health.

Hoffman, Adolph J., Madison, N. J.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1911; died, November 22, of pneumonia; aged 36.

King, William W., Brooklyn, N. Y.; New York College of Dentistry; died, October 15, from injuries received in an automobile accident; aged 76.

Palmer, Stephen, Poughkeepsie, N. Y.; New York College of Dentistry, 1890; died, October 12; aged 59.

Peterson, Julius A., Duluth, Minn.; University of Minnesota, College of Dentistry, 1918; died, October 28, a suicide, after a nervous breakdown; aged 32.

Sage, Louis Enos, Bridgeport, Conn.; Pennsylvania College of Dental Surgery, 1876; died, November 12, of heart disease; aged 75.

Sexton, Horatio C., Shelbyville, Ind.; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1889; died, November 14, after a year's illness; aged 57.

Stine, Thaddeus, Tyrone, Pa.; Pennsylvania College of Dental Surgery, 1892; died, November 16, of appendicitis; aged 56.

Wright, Albert M., Troy, N. Y.; Regents of the University of the State of New York, 1892; died, November 8, of heart disease; aged 78. Dr. Wright was a past president of the Dental Society of the State of New York, and for many years and up to the time of his death president of the New York State Dental Examining Board.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Nitrous Oxid Anesthesia: In Desmarest's opinion (*Presse Med.*) nitrous oxide is especially advised in exhausted, infected or anemic patients, when chloroform or ether is contraindicated. Owing to the hypertension-inducing effect, nitrous oxide maintains the heart action and is, therefore, useful in prolonged operations. It was never followed by postoperative acidosis in his diabetic patients. It is the best anesthetic for minor operations, in reduction of dislocations, and painful dressings. It seems to be more effectual and less dangerous than ethyl chloride. No complications on the part of the lung, liver or kidney were ever observed.—Abstr. *J.A.M.A.*

New Work on Pyorrhea: A new effort to establish a specific causative organism for pyorrhea and to investigate its remote effects has just been made public. (An Experimental Study of the Streptococci Found in Pyorrhea Alveolaris, by Thompson [Edinburgh M. J., December, 1925]. In the selection of material for study, only such patients were chosen by the author as gave evidence of some condition apparently secondary to the pyorrhea. Of the various organisms that have been incriminated as causative agents—streptococci, staphylococci, pneumococci, Micrococcus *catarrhalis*, *B. fusiformis*, certain spirochetes and Endameba gingivalis—the investigation was again limited to streptococci, as being the most likely of the group to be the cause of secondary disease. For practical purposes, the investigator accepted the classification of streptococci promulgated by Holaan, who divided all organisms of this class into two large groups, hemolytic and nonhemolytic, with a subdivision of each of these groups into eight subclasses based on their action on certain differential sugars. Adequate care was taken to prevent contamination of the cultures by mouth organisms. Pneumococci were excluded and in every case a pure culture of streptococci was obtained. The results showed that "(1) streptococci are constantly present; (2) they belong to the nonhemolytic group, and (3) they include different fermentative types; e. g., mitis, salivarius and fecalis." Virulence of the organisms found was low. In the organs of experimental animals injected with isolated organisms, the following secondary pathologic changes were found: in the heart, endocarditis; in the kidney, interstitial nephritis and abscesses; in the bones slight osteolysis and some evidence of aplasia in the marrow; in the spleen, granules in the cells and large amounts of hemosiderin; in the stomach in one instance, ulcers, and in the aorta, atheroma. Extremely interesting, however, is the fact that arthritis was not found in those animals inoculated with the usual nonhemolytic strains.—*J. A. M. A.*, Jan. 9, 1926.

What Do We Mean by "Naughtiness"?: Are we not still inclined to regard social misbehavior as "innate wickedness"? The reasons for the failure to learn control may result from defect or disease, or it may be the outcome of lack of training, or training that promotes delinquency. Society should not only punish the delinquent but should seek to prevent the delinquency, by seeing that the proper training is given. The author (H. Douglas Singer, *Wis. M. J.*) gives several brief illustrations of faulty training, and concludes by saying that naughtiness is not an inherent quality but is the outcome of quite natural and essentially valuable longings and desires, which for some reason have not been subjected to the control of habits that are socially permissible.—Abstr. *Am. J. Dis. Child.*

Suppurative Diseases of Lung Due to Inspired Foreign Body: Pulmonary suppuration starting endobronchially and due to the presence of a foreign body is, when contrasted with embolic, postpneumonic and postinfluenzal suppurations, such a mild, slow and restricted process and manifests such a tendency to prompt and complete recovery after removal of the foreign body as to suggest the existence of some sort of physiological or structural barrier against the invasion of suppurative

processes by the endobronchial route. The characteristics are present in a less degree, minus the germicidal powers, in other kinds of foreign bodies; but, even in these, the prompt recovery in almost all cases, if the foreign body has not been long in the tracheobronchial tree, is in marked contrast to lung suppuration of any etiology other than that of foreign body. Complete recoveries followed in the long series of cases, after foreign body suppuration of from ten to thirty-six years' duration, with no treatment other than the removal of the foreign body.—Chevalier Jackson, in *Surg. Gynec. & Obst.*, abstr. *Am. J. Surg.*

Treatment of Tic Douloureux: Mills prefers alcohol injections to operation in the treatment of these cases. Out of every four cases, three patients have been reasonably comfortable with injection and one has needed open operation.—*Brit. M. J.*, abstr. *J.A.M.A.*

Iodine Treatment of Actinomycosis: From 5 to 10 minims of iodine in half a cup of milk, three times a day, has proved ample to effect a cure in the four cases of actinomycosis reported by Chitty.—*Brit. M. J.*, abstr. *J.A.M.A.*

Religion, Pseudo-Religion, Science and Public Health: Why does supersition make a stronger appeal today than it did a half century ago? Why do men and women leave scientific medicine and go to charlatans? The scientific mind which trusts in reason is a recent acquisition—as compared with the antiquity of the race—born but yesterday; its place in our mental makeup is insincere; it is exacting and mankind is mentally lazy. The recent trial in Tennessee, the suit brought in the District of Columbia, the statements of the fundamentalists, all show that our liberties are in danger. Public health cannot survive the death of the suppression of the fundamental sciences. It has been plainly shown that even in a court of justice, the scientists will not be allowed to have their say and to present the irrefutable evidence on which their beliefs are founded. Public health officials, especially if they are also practitioners of medicine, come into contact with large numbers of people. Each individual should be a missionary. He should be well posted on current literature—such books, for example, as have been written by Osborn in this country and Thompson in England. People are anxious to know and to learn, but magic appeals to the average mind more than does reason. Let us stress the wonders of medicine. Is there any romance more full of holding interest than the discovery of the malarial parasite, the discovery of the agency of the mosquito in carrying yellow fever, the cleaning up of the Isthmus of Panama and the making habitable of tropical countries in which the white man had never been able to live? Does romance offer anything more thrilling than the search for quinine, or the plant which gives chaulmoogra oil? Is there anything in fiction as marvelous as the relation between the mosquito and the parasites of malaria and yellow fever? Do we ourselves appreciate these things, and if so, are we familiar enough with the story to tell it in an interesting way to laymen?—*Am. J. Pub. Health*, December, 1925.

Explosion in Acetylene Anesthesia: Oehlecker (*Zentralbl. f. Chir.*) discusses the danger of explosion in acetylene-oxygen anesthesia. It seems that the presence of particles of oil—instead of the acetylene—accounted for two such explosions. It is not sufficiently widely known that oxygen alone may cause grave explosions when it blows over oil. A whole oxygen tank may explode if oil is used to lubricate the valves. Every oxygen tank should be labeled "Beware of approaching with fat or oil."—Abstr. *J.A.M.A.*

Navy Equalization Bill: "This bill provides for the same opportunity for promotion at exactly the same time for all officers of the Navy who are contemporaries and does away with the line and staff controversy which has been a bone of contention in the Navy for generations. The real significance of the bill is that it gives justice to the members of the medical and dental corps of the Navy. Previous to the enactment of this legislation dental officers could not go beyond the rank of lieutenant commander, and medical officers went with the line as far as the grade of lieutenant commander, remaining there until some one ahead of them either retired or died. This arrangement was unfair and placed the medical corps of the Navy in a most unsatisfactory position. I was very glad to lend my best efforts to the so-called Navy equalization bill which remedied the injustice to the officers of the medical corps."—July 17, *Appendix Cong. Rec.* of July 12.

Announcements

CALENDAR OF MEETINGS*

NATIONAL SOCIETIES

American Dental Association, October 24-28, 1927, Detroit, Michigan.

American Society of Orthodontists, May 3-6, 1927, Chicago, Illinois.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June inclusive.

January (1927)

California, at San Francisco (24-28).
New Jersey, at Trenton (15). (Midyear.)
Rhode Island, at Providence (12-13).

February (1927)

Minnesota, at St. Paul (23-25).

March (1927)

Louisiana, at New Orleans.
Montana, at Billings (24-26).

April (1927)

Alabama, at Montgomery (12-14).
Connecticut, at New London (28-30).
Kansas, at Topeka (20-22).
Kentucky, at Louisville (5-7).
New Jersey, at Newark (27-30).
North Carolina, at Greensboro (11-13).
Oklahoma, at Oklahoma City (25-28).

May (1927)

Arkansas, at Hot Springs (9).
Illinois, at Peoria (10-12).
Indiana, at Indianapolis (16-19).
Iowa, at Des Moines (3-5).
Maryland, at Baltimore (2-4).
Massachusetts, at Boston (2-6).
Nebraska, at Omaha (16-19).
New York, at Buffalo (18-20).
Pennsylvania, at Pittsburgh (10-13).
South Carolina, at Columbia (9-11).
South Dakota, at Sioux Falls (9-11).
Tennessee, at Memphis.
Texas, at Austin (10-13).
Vermont, at Burlington.
West Virginia, at Martinsburg (16-18).

June (1927)

Colorado, at Colorado Springs (15-18).
Georgia, at Albany.
Maine, at Rockland.
New Mexico, at Roswell.
Wyoming, at Thermopolis.

July (1927)

Porto Rico, at San Juan.
Wisconsin, at Milwaukee (12-14).

October (1927)

Florida, at St. Petersburg.

Chicago Dental Society, at Chicago, Illinois, January 26-28, 1927.

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

Delaware, at Wilmington, January 19-20, 1927. Secretary, W. S. P. Combs, Middletown, Delaware.

District of Columbia, at Washington, D. C., January 10-14, 1927. Secretary-Treasurer, C. Willard Camalier, 406 Medical Science Building, Washington, D. C.

North Carolina, at Raleigh, January 10, 1927. Secretary, H. O. Lineberger, Raleigh, North Carolina.

North Dakota, at Fargo, January 10. Secretary, W. E. Hocking, Devils Lake, North Dakota.

*Announcements must be received by the ninth of the month in order to be published in the forthcoming issue of THE JOURNAL.

South Dakota, at Sioux Falls, January 3, 1927. Secretary, G. G. Kimball, Mitchell, South Dakota.

KANSAS STATE DENTAL ASSOCIATION

The date of the Kansas State Dental Association has been changed from April 18-20 to 20-22, 1927.

C. K. WEAVER, *Secretary*,
Clay Center, Kan.

MONTANA STATE DENTAL ASSOCIATION

The next meeting of the Montana State Dental Association will be held in Billings, March 24-26, 1927.

J. E. BUEHLER, *Sec'y-Treas.*,
Great Falls, Mont.

NEW JERSEY STATE DENTAL SOCIETY (Midyear Meeting)

The midyear meeting of the New Jersey State Dental Society will be held at the Stacy-Trent Hotel, Trenton, Saturday, Jan. 15, 1927. Clinics will be conducted from 10 a. m. to 12 m. and from 2 to 4 p. m., followed by the president's dinner, at 6:30 p. m.

A. E. BOICE, *General Chairman*,
Broad St. Bank Bldg.,
Trenton, N. J.

NEW JERSEY STATE DENTAL SOCIETY

The fifty-seventh annual meeting of the New Jersey State Dental Society will be held at the Robert Treat Hotel, Newark, April 27-30, 1927. The program is in charge of R. S. Hopkins. Sandal Hirsch will manage the exhibits, and R. T. Vichers will have charge of the clinic program.

EDWARD L. WHARTON, *Chairman*,
Publicity Committee,
21 Fulton St., Newark, N. J.

NORTH CAROLINA DENTAL SOCIETY

The next annual meeting of the North Carolina Dental Society will be held in Greensboro, April 11-13, 1927.

DENNIS F. KEEL, *Sec'y-Treas.*,
Greensboro, N. C.

OKLAHOMA STATE DENTAL SOCIETY

The next meeting of the Oklahoma State Dental Society will be held in Oklahoma City, April 25-28, 1927.

ROY H. ELLIS, *Secretary*,
Okmulgee, Okla.

RHODE ISLAND STATE DENTAL SOCIETY

The annual meeting of the Rhode Island State Dental Society will be held, Jan. 12-13, 1927, at the Providence Biltmore Hotel, Providence.

B. CECIL BURGESS, *Chairman*,
Executive Committee.

SOUTH CAROLINA STATE DENTAL ASSOCIATION

The 1927 meeting of the South Carolina State Dental Association will be held in Columbia, May 9-11.

T. C. SPARKS, *Recording Sec'y.*,
State Board of Health,
Columbia, S. C.

DELAWARE STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Delaware Board of Dental Examiners will be held in the Municipal Bldg., Tenth and King streets, Wilmington, Jan. 19-20, 1927, 9 a. m. to 5 p. m.

W. S. P. COMBS, *Secretary*,
Middletown, Del.

FLORIDA STATE BOARD OF DENTAL EXAMINERS

All dentists holding license to practice in Florida are required to register annually with the secretary of the board. Annual registration fee, $3.00, due January 1.

R. P. TAYLOR, *Secretary*,
414 St. James Bldg.,
Jacksonville, Fla.

CHICAGO DENTAL SOCIETY'S ANNUAL MID-WINTER CLINIC

The annual midwinter meeting of the Chicago Dental Society is to be held at the Drake Hotel, Jan. 26-27-28, 1927. This year's program is to be divided into nine sections, covering all phases of dentistry. Three half days are to be devoted to scientific papers and two half days to clinics and lecture clinics.

Wednesday evening, a joint meeting with the Chicago Medical Society is to be staged. Hugh S. Cumming, Surgeon General, U. S. Public Health Service, Thomas L. Gilmer and William Allen Pusey, Past President of the American Medical Association, are to be the essayists, discussing diseases of the mouth.

At the annual banquet, Thursday evening, no speeches will be made, but there will be an entertaining program, ending with a cotillion, with favors and good music. The presidents of the state dental societies of America have been invited to be the guests of honor. A cordial invitation is extended to all ethical practitioners who are members of the A. D. A.; ethical practitioners of medicine; laboratory men vouched for by members of the Chicago Dental Society or members of the Laboratory Men's Association; senior students of the three dental schools of Chicago with credentials from their deans; and teachers and nurses engaged in public health work.

Following are some of the essayists: C. M. Kennedy, Des Moines, Iowa; Russell W. Bunting, Ann Arbor, Mich.; John A. Marshall, San Francisco; Arthur D. Black, Chicago; H. A. True, Des Moines, Iowa; R. R. Byrnes, Atlanta, Ga.; Russell W. Tench, New York; W. A. Giffen, Detroit; H. A. Potts, Chicago; R. O. Schlosser, Chicago; C. J. Stansbery, Seattle, Wash.; F. M. Hight, Houston, Texas; Rupert E. Hall, Chicago; J. W. Crawford, Milwaukee; E. T. Tinker, Minneapolis; H. A. Maves, Minneapolis; Walter F. Chappelle, Buffalo; B. B. McCollum, Los Angeles; Hermann E. S. Chayes, New York; W. A. Squires, New York; A. C. Nickel, Mayo Clinic; A. W. Bryan, Iowa City; John J. Posner, New York; E. I. McKesson, Toledo; Louis Schultz, Sr., Chicago; Chalmers J. Lyons, Ann Arbor; Julius Grinker, Chicago; Thomas L. Grisamore, Chicago; Lloyd S. Lourie, Chicago; Charles R. Baker, Chicago; James A. Burrill, Chicago; Frederick B. Noyes, Chicago; Martha R. Jones, San Francisco; W. J. Charters, Des Moines; Joseph A. Pollia, Los Angeles; Hugh W. MacMillan, Cincinnati; M. J. Hubeny, Chicago; Robert H. Ivy, Philadelphia; Hermann Prinz, Philadelphia; Kaethe W. Dewey, Chicago; J. P. Simonds, Chicago, and many others.

A special feature will be the scientific exhibits, food exhibits and public health exhibits; public speaking; complete medical examinations by members of the medical profession; mouth hygiene, etc. One hundred and fifty dental dealers and manufacturers have taken space in what will be the finest exhibit display ever held, this to be in the main dining room of the Drake Hotel. Howard C. Miller is chairman of exhibits; Otto U. King, chairman, Program Committee; Stanley D. Tylman, chairman of clinics.

JOHN H. CADMUS, *President*
HUGO G. FISHER, *Secretary*

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

The North Dakota State Board of Dental Examiners will meet in Fargo the second Tuesday in January. All applications must be in the hands of the secretary ten days before the examination. For applications and further information address

W. E. HOCKING, *Secretary*,
Devils Lake, N. D.

SOUTHERN SOCIETY OF ORTHODONTISTS

The next meeting of the Southern Society of Orthodontists will be held at the Battery Park Hotel, Asheville, N. C., Feb. 28-March 2, 1927. All ethical members of the American Dental Association will be cordially welcome. For further information, address

OREN A. OLIVER, *Sec'y-Treas.*,
440 Lambuth Bldg.,
Nashville, Tenn.

STATE UNIVERSITY OF IOWA COLLEGE OF DENTISTRY AND ALUMNI CLINIC

The College of Dentistry and Alumni Clinic of the State University of Iowa, Iowa City, will be held, Feb. 21-22, 1927, with a general clinical program by selected clinicians and lectures by W. E. Cummer of the University of Toronto on "Partial Dentures—Designs and Construction." Hotel reservations should be made.

H. B. BROCK, *President*,
Grinnell, Iowa.
ERLING THOEN, *Secretary*,
Iowa City, Iowa.

THE AMERICAN DENTAL SOCIETY OF EUROPE

The next meeting of the American Dental Society of Europe will take place in Paris, Aug. 1-3, 1927.

E. D. BARROWS,
71 Harley St., London, W. 1

RESOLUTIONS ON THE DEATH OF DR. JULIUS A. PETERSON

WHEREAS, it has pleased the Almighty God in his infinite wisdom to remove by death an esteemed and respected member of the profession; and

WHEREAS, the Duluth District Dental Society of the State of Minnesota has suffered the loss by death of its president, Dr. Julius A. Peterson, which occurred Oct. 28, 1926; and

WHEREAS, we the members of this society wish to express the loss we so keenly feel; the loss of one whose accomplishments in his chosen field are an inspiration to his fellow practitioners and an illuminating example of his devotion, energy and love for his profession; his loftiness of purpose, his beautiful personality, his determination of an unselfish career of service to his fellowman, will be reflected back to us, who knew him best, and thus it will be said that the world is better because he lived; therefore, be it

Resolved, that this society extend its sincere sympathy to his wife, his father and his sisters in their bereavement, which is the bereavement of the state as well as of the Duluth District Dental Society; and be it further

Resolved, that a copy of these resolutions be spread upon the minutes, sent to the members of his family and to the dental journals for publication.

Adopted Nov. 1, 1926.

DULUTH DISTRICT DENTAL SOCIETY,
Duluth, Minnesota.

RESOLUTIONS ON THE DEATH OF DR. ALBERT M. WRIGHT

Resolved, that in the removal by death from our membership of Dr. Albert M. Wright, the Third District Dental Society has lost not only its oldest active member but also its most active and useful member, in terms of service to the society, and to dentistry at large in the state. His life among us has been one of full usefulness, and the record of his services, when made up, will be an inspiration and encouragement to us to carry on the work for the public good in which he had so large a part.

Resolved, that a copy of this resolution be sent to the family of Dr. Wright and that we extend to them our sincerest sympathy in their great sorrow.

Your committee respectfully submit this report and accompanying resolutions, and move their adoption.

Necrology Committee
J. W. CANNADAY, SR., *Chairman*,
J. H. CARTER
L. J. GALE
G. A. ENGLERT, SR.
W. B. PARK
G. W. VANDERPOOL
M. J. BARRETT

Nov. 11, 1926.

BOOK REVIEWS

Prunes and Pancakes: By Alfred Owre, D.M.D., M.D., C.M., B.A. 124 pages; price 75 cents. Published by the University of Minnesota Press, Minneapolis, Minn.

Under this somewhat frivolous title, Dr. Owre has given us a book which deals most entertainingly with the subject of diet. As the book develops, it is apparent that the author is more partial to prunes than to pancakes, and he sets forth the reasons for the

faith that is in him. It is in many respects the record of his personal experience, and, when studied in this light, his arguments become very convincing. He does not claim to present a scientific disquisition on diet, but merely to suggest a practical guide for the average individual in his selection of a rational diet. Viewed in this light, the book is of immense value, and we predict that it will do greater concrete good than some of the more scientific and pretentious volumes that have preceded it. Every contribution to the important question of diet should be welcomed, and Dr. Owre's book will prove a worthy addition to the literature on the subject.

Principles and Practice of Oral Surgery. By S. L. Silverman, D.D.S., F.A.C.D., Clinical Professor of Oral Surgery, Atlanta-Southern Dental College; Associate Professor of Surgery (Oral) Emory University, School of Medicine; Formerly Special Lecturer on Oral Surgery Columbia University, New York; Oral Surgeon to the City (Grady) Hospital, Scottish Rite, Piedmont and St. Joseph Hospitals; Consulting Oral Surgeon to U. S. Veterans Hospital, Atlanta, Georgia. With 280 illustrations. 326 pages. Published by P. Blakiston's Son & Co., Philadelphia.

In the preface to his book, Dr. Silverman says: "I had two viewpoints constantly in mind: (1) to try to produce a work that would be sufficiently elementary for the undergraduate; therefore, definitions, synonyms, as well as other helpful data are included for his benefit; (2) for the practitioner, for whom detailed technic and step by step illustrations were especially prepared." This practically gives the keynote to the purpose of the book. One great virtue of this volume is the fact that there is no padding with verbiage. For instance, a consideration of Vincent's stomatitis (trench mouth) takes only half a page. The illustrations in the book are excellent, and the text is large and clear. Everyone interested in the subject should have this book, and it would not be amiss for the general practitioner to obtain a copy for purposes of early recognition of the various affections as they appear in routine practice. There must be closer cooperation between the specialist in oral surgery and those engaged in general practice, to the end that more prompt attention shall be given disease processes in their inception.

Diseases of the Teeth, Their Diagnosis and Treatment. By John Albert Marshall, D.D.S., Ph.D., Professor of Dental Pathology and Biochemistry, University of California. Illustrated with 114 engravings. 331 pages. Published by Lea & Febiger, Philadelphia and New York.

The material in this book is practically that used by the author in his college lectures, and it is therefore the latest presentation of the various subjects. The illustrative features of the book are excellent, most of the cuts being made from the author's own slides. One of the most impressive things about the volume is the very extensive bibliography printed after each chapter. For instance, following the chapter on "Dental Caries," there are 267 references and nearly that number after "Pulp Canal Therapy." This shows the extent to which Dr. Marshall has gone into the various subjects, and the reader may therefore be assured of getting the most comprehensive, though condensed, consideration of the different topics. Altogether, this book will prove a very worthy addition to the permanent literature of the profession, and we commend it most heartily.

PATENTS OF INTEREST TO DENTISTS

1492715. Dentifrice, Rudolph A. Kuever, Iowa City, Iowa.

1493720. Dental clasp, Hugo Aderer, East Orange, N. J.

1493469. Casting machine, De Forest W. Candler, Detroit, Mich.

1494062. Rotary toothbrush, James R. Cruikshank, Vancouver, Canada.

1493578. Dental bridge repair device, Howard R. Kidd, Okmulgee, Okla.

1493692. Dental casting machine, Thomas A. Mixon, Atlanta, Ga.

1493581. Dental implement, Walter Watts, Washington, D. C.

1493662. Denture plate, Joseph R. Wilk, Chicago, Ill.

1494327. Dental tool, Charles H. Adelman, Pittsburgh, Pa.

1494679. Dental floss holder, Robert R. Fischer and A. List, Oakland, Calif.

1494809. Dental syringe, Benjamin F. Sahr, Hutchinson, Minn.

Copies of these patents may be obtained for twenty-five cents each, by addressing John A. Saul, Solicitor of Patents, 509 Seventh St., N.W., Washington, D. C.

A RESOLUTION
FOR THE NEW YEAR

By Ernest V. Madison

BUSINESS is ever moving.

Ideas become obsolete and methods change or new methods are discovered from day to day.

Installation of improved or new equipment will be necessary to management so long as calendar sheets are torn off.

The business executive must be prepared to know just what to do, and his knowledge must be revised and supplemented from time to time.

He can modernize his knowledge by reading the advertising pages of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION. The advertisements contained therein are concise treatises on the principles, construction and proven accomplishments in products manufactured for this field.

Could there be, then, a better resolution for the New Year than that we will make sure to read through the advertising pages in each issue of THE JOURNAL?